THE MULTIPLE

Cubism breaks with Renaissance perspective. It views objects relatively: that is from many points of view, no one of which has exclusive authority. And in so dissecting objects it sees them simultaneously from all sides—from above and below, from inside and outside.

SIGFRIED GIEDION, *SPACE, TIME AND ARCHITECTURE*

Cubism, by seizing on instant total awareness, suddenly announced that *the medium is the message*. Is it not evident that the moment that sequence yields to the simultaneous, one is in the world of structure and configuration?

MARSHALL MCLUHAN, *UNDERSTANDING MEDIA: THE EXTENSIONS OF MAN*

5 FROM SEQUENCE TO MULTIPLICITY[1]

Cubist painting, as described in the epigraphs to this chapter, not only fractured the single viewpoint but also placed disparate objects on the same spatial plane, adjacent and simultaneous. In striking contrast to the many modes of representation that shattered the fixity of single-point perspective, the media of film and television—in their dominant forms through most of the twentieth century—were viewed in a single frame, seen on a single screen. Variations of scale, position, and camera angle from shot to shot may alter the positioned fixity of the camera's view, but these shifts in "perspective" are *sequential* and do not occur on the same picture plane as in cubist painting, chronophotography, or dadaist collage.[2] As moving images follow each other in sequence—frame-by-frame, shot-by-shot—they are held within the fixed frame of a screen, a surface that holds its constancy regardless of the continuous or radically discontinuous spatial and temporal relation between shots. In this way, the prevailing format for moving-image media did not follow literary, painterly, or even architectural challenges to the perspectival frame but held on much longer to the strictures of its "symbolic form." In the century-long history of film and the half-century-long history of television, there are only limited examples of either multiple-screen display or multiple-screen composition within the single frame.[3] That is, until recently. With the advent of digital imaging technologies and new technologies of display in the 1990s, the media "window" began to follow painting's and architecture's lead in the challenge to a fixed perspective.

Hyperboles invite a challenge: there were, of course, exceptions to the dominant single-frame, single-screen paradigm. Experiments by filmmakers who toyed with layers of superimposition, split screens, and multiple-screen projections—from Richter to Ruttman, from Brakhage to Warhol, from Abel Gance to Charles and Ray Eames, from Zbigniew Rybczynski to Mike Figgis—provide a catalog of resistance to the dominant form of screenic display. But these exceptions also prove the rule. The rapid and recent remaking of cinematic, televisual, and computer-based forms of imaging and display force us to note, in retrospect, the remarkable historical dominance of the single-image, single-frame paradigm as an intransigent visual practice.

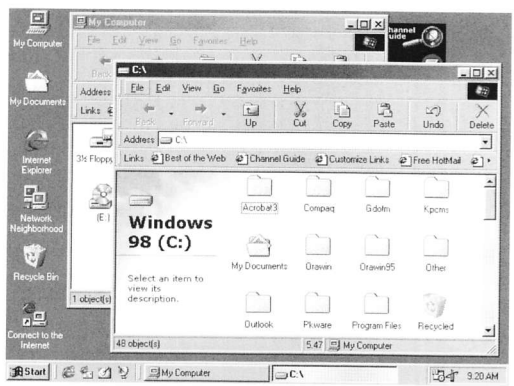
The televisual image largely followed the cinema's conventions of a single-screen format and sequential flow, but once the televisual apparatus became a multiple-channel receiver with the capacity for switching channels at will, aided and accelerated by a remote-control device, television added a new axis of spatial and temporal depth to the cinema's fixed sequentiality. The armchair televisual viewer is a *montagist,* composing a sequenced view from a database of channels and delivery formats, a random set of synchronic

alternatives to the single-screen view. And as recent televisual features (programming style cluttered with text crawls and inset frames; monitors enabled with "picture-in-picture" display) facilitate multiple-screen insets, televisual "windows" have become multiple and simultaneous receivers of a variety of programming.[4]

In the short span of the last two decades, the introduction of computer-generated images and digital display technologies has radically transformed the space of the screen.[5] Before digital imaging, the virtuality of representation was measured in brushstrokes, by the use of color and shadow, and was eased by perspectival techniques, by drawing aids like the camera obscura, and by varying levels of artistic skill. Digital imaging technologies not only make it easier to conduct "cut-ups" and collages, to construct seamless substitutions and simulation effects, but also ease the use of inset framing devices, to facilitate multiple "windowed" screens. Digital multiples are readily cloned and easily deployed; gravity-defying digital effects change the physical and temporal laws of the computer-rendered environment. If the digital image is postphotographic; the digital moving-image is postcinematic.[6]

5.1 Frame still from *Time Code,* directed by Mike Figgis, 2000.

5.2 Frame still from *24* (Fox Television, 2001).



5.3 Screen shot, computer window with Windows.

And yet the markers of these changes are recent. As I will describe in this chapter, they have emerged alongside the developing display interface of the computer screen. The "graphical user interface" (GUI) transformed the computer screen from a surface with glowing symbols and text to one which displayed icons and, later, digital images. The GUI display introduced an entirely new visual system—a text or image in one "window" meeting other texts or images in other "windows" on the same screen. The multiple framed images of Muybridge (seen in sequence) and the silkscreen multiples of Andy Warhol (seen in repetition) contained images that exist in relation to each other, whereas the "windows" of the computer may not. Cinema and

television screens, the once sacrosanct domain of the single image, have been invaded by text crawls, inset screens, pop-up windows. Multiple-frame images are a readable new visual syntax, a key feature in the contemporary remaking of a visual vernacular.

If we follow Panofsky's assertion that perspective was a "symbolic form"—a way of apprehending the world through a mental apparatus—then the representational postulates of perspective have met their end on the computer screen. And, if we accept Panofsky's further argument that perception is conditioned by representational habits, then our new mode of perception is multiple and fractured. It is "postperspectival"—no longer framed in a single image with fixed centrality; "postcinematic"—no longer projected onto a screen surface as were the camera obscura or magic lantern; "post-televisual"—no longer unidirectional in the model of sender and receiver.

THE MOVING IMAGE AND THE MULTIPLE FRAME IN FILM AND TELEVISION

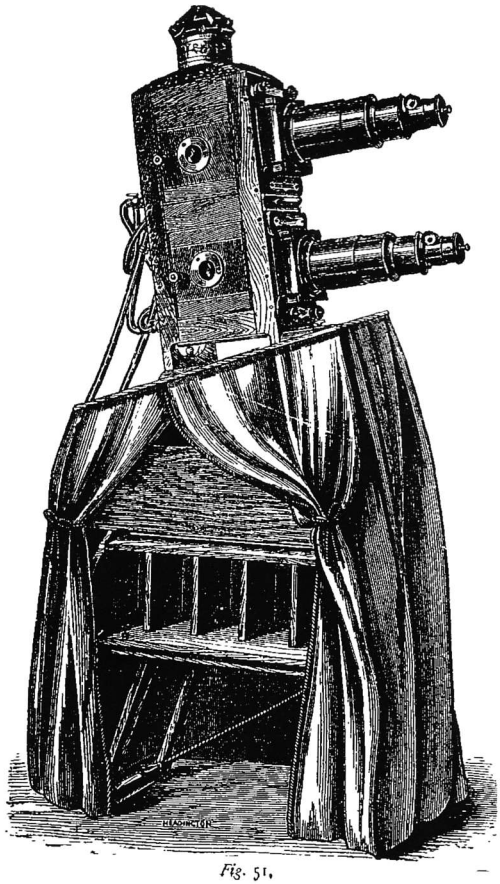
> *Painters had discovered that one observation point, in spite of emphasis by distortion, was not sufficient to give the spatial essence of the object.* . . . Painters shifted the point of vision into a kind of cinematographic sequence, and represented the projection of several points of view in one picture.
>
> —Gyorgy Kepes, *Language of Vision* (emphasis added)

> *The spectator is not just responsive to what is moving but also to what stays in place, and the perception of movement supposes fixed frames.*
>
> —Pierre Francastel, "Espace et illusion"

As Gyorgy Kepes suggests in the above epigraph, in the single-spatial plane of cubist painting, "Painters shifted the point of vision into a kind of cinematographic sequence, and represented the projection of several points of view in one picture."[7] Kepes's introduction of the cinematic metaphor describes the stuttering representation of movement, a "cinematographic sequence" seen arrayed on one spatial plane, as well as the polyscenic, multiple time-frame found in cubist and futurist paintings such as Picasso's *Les demoiselles d'Avignon* (1907), Giacomo Balla's *Dynamism of a Dog on a Leash* (1912), and Marcel Duchamp's *Nude Descending a Staircase, No. 2* (1912). Pierre Francastel reminds us of another aspect of the cinematographic sequence, one that remains insistent through most of the cinematic century: the perception of cinematic movement "supposes" the fixed frame of the screen.[8]

THE SINGLE FRAME, THE SINGLE SCREEN

In Charles Musser's account, the "history of screen practice" was marked by several major technological transformations: the development of the magic lantern in the 1650s, the adaptation of photographic slides for projection around 1850, and the projection of chrono-photographic images around 1895.[9] These technical turning points in the emergence of a "screen practice" mark the addition of photography to magic lantern projection. Yet an examination of the emerging cultural practices of image projection will also indicate what remained constant during these changes: viewers faced projected images on a screen, and most commonly, these images were projected sequentially rather than arrayed adjacently.[10] This practice was not determined by the limits of existing technology but, instead, by the representational convention of the single image in a single frame. Multiple lanterns were routinely used by phantasmagoria exhibitors to create composite effects; two projectors could have been placed side by side from the earliest moments of screen practice.



5.4 Malden Bi-Unial lantern, from W. J. Chadwick, *The Magic Lantern Manual* (London: Frederick Warne, 1878).

Although the popular mid-nineteenth-century term for slide projection—the "stereopticon"—might seem to indicate a system for two-slide projection, the term was adapted because of the common practice of transferring stereoscope views to ground glass, cutting the double image in half, and selling them separately as lantern slides.[11] Even before lantern slide images began to rely on photography around 1850, the prevailing exhibition practice was to project single-frame images despite discontinuities in the image (its angle, its distance) as slides were projected in sequence.[12]

As an exemplary indication of late-nineteenth-century magic lantern technique, the 1878 handbook *The Magic Lantern Manual* details a variety of lantern types and instructions for their use. Its author describes the operation of the Malden Bi-Unial Lantern (figure 5.4): "[it] combines two lanterns in one, having their optical systems placed one over the other.

This form of Dissolving View seems the one most in general use at the present time."[13] The "Bi-Unial" lantern had two separate optical systems and technically could have projected images in multiple array. Instead, the standard practice involved using the two lenses to dissolve between images—one on top of the other—in the appearance of a single frame.

In this regard, the emerging use of projected lantern slides in art history lectures formed an important contrast to the predominant forms of late-nineteenth-century entertainment and the emerging format for moving images. The comparative method of the double-slide lecture became one of the pedagogical mainstays of German art historian Heinrich Wölfflin soon after he began to lecture at the University of Berlin in 1901. Wölfflin's predecessor at the University of Berlin, Hermann Grimm, had used slides extensively in his lectures in the late 1890s. Wölfflin began to use two slide projectors, arranged side by side, so that he could compare different images or show details alongside the principal image. The use of double-slide projection allowed the viewer to consider one image in relation to another image—to compare an image to one of an earlier time, to a closer detail, to a contrasting style. The conclusions drawn from this method were comparative and analytic.[14]

By contrast, the emerging mode of moving-image projection retained the singularity of one image, one screen. As lantern images were projected in increasingly rapid succession (with apparatuses like L. S. Beal's 1866 choreutoscope or Coleman Sellers's 1861 kinematoscope, or Muybridge's 1880 photographic-based zoopraxiscope), images were projected in sequential dissolve.[15] Between 1896 and 1900, many different inventors, manufacturers, filmmakers, exhibitors, and entrepreneurs struggled to define the format and venue for moving images, but there was a remarkable consistency in the form of single-screen projection.[16] The technical systems for projection available by 1896—the Lumières' Cinématographe, R. W. Paul's animatographe and Theatrograph, Jenkins and Armat's Phantoscope, Edison's Vitascope, but also Lyman H. Howe's animotoscope, W. Watson's motograph, William Paley's kalatechnoscope, Herman Casler's Biograph, Charles Urban's bioscope, and Latham's eidoloscope—all had different capabilities and relied on different patents and construction, but they had one common element: all projected single-screen images, seen in a single frame.[17]

Even so, the many systems for exhibiting moving images demonstrated the uncertainty about what the predominant form of the medium would be. At the Paris 1900 Exhibition, Raoul Grimoin-Sanson's ten-projector Cinéorama provided spectators with an unframed 360-degree view of projected moving images,

while the Lumières' Grand Écran/Cinématographe Géant projected a program of films and color slides onto an immense screen that could be viewed from both sides.[18] The size and format of single-screen projection, viewed by spectators in fixed seats facing the screen, was not yet the dominant form. The cultural practice that emerged for the projection of moving images on a screen did not deploy multiple projectors but, instead, cast a single image on a single screen.

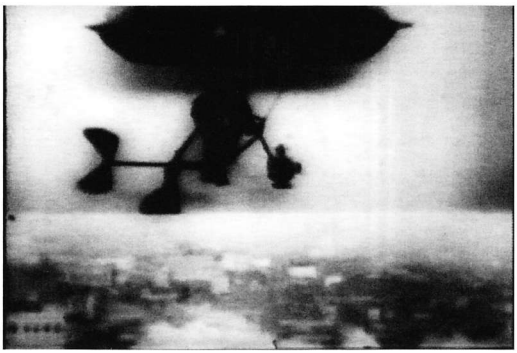
THE MOVING IMAGE IN A SINGLE FRAME: THE COMPOSITE SHOT

The first recorded moving images evidenced a broad range of camera angles, camera distances, and locations—the Lumière brothers' outdoor *actualités* of workers leaving the Lumière photographic plate factory (*Sortie d'usine,* filmed directly facing the action), the arrival of a train at the station (*Arrivée d'un train à La Ciotat,* filmed from a dynamic diagonal angle), and the baby eating breakfast (*Repas de bébé,* filmed from a closer camera position), or the in-studio films of W. K. L. Dickson and Thomas Edison, which staged action against flat black backgrounds inside of the "Black Maria" (*The Leonard-Cushing Fight,* filmed in six separate one-minute "rounds" for separate ten-cent kinetoscope view; *The Kiss; The Corbett-Courtney Fight*). Whatever the differences were in the first single-shot films, their action was contained within the bounds of a single frame and was projected onto a single screen.

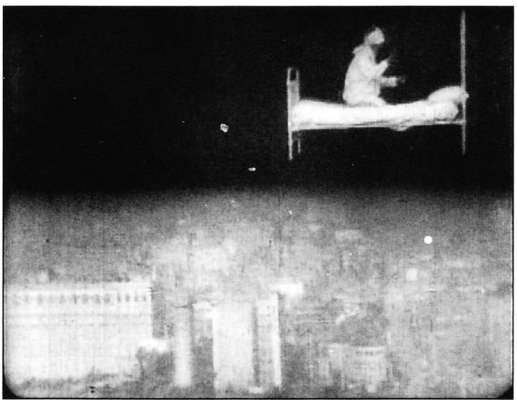
Even when filmmakers discovered the stop-action trick (the camera was stopped during filming and a substitution was made before the camera commenced filming again), this special effect relied on maintaining the continuity of the frame. The one-shot film *The Execution of Mary Queen of Scots* (1895, made by Arthur Clarke for the Edison Manufacturing Company) provides a simple example. An actor dressed as Queen Mary posed with his head on the execution block, the camera stopped, a mannequin was substituted, and the camera recommenced filming as the guillotine made its cut. The resulting film displays the regicidal decapitation within the seeming continuity of one shot. The "ontological cut" here was invisible, in the missing time between frames. Films by Georges Méliès, Ferdinand Zecca, and others relied on this stop-action trick to enact a new visual system based on disappearances, substitutions, reappearance, and the "seamless" cut.

5.5 Single image, single frame: frame enlargements from Lumière *actualités,* 1895.

Early filmmakers were also quick to exploit the potential of "double exposures," exposing portions of the film more than once. Following the magic lantern tradition of dissolving views between slides, in-camera double exposures were used to supply dissolve transitions between two separate "shots." Yet the resulting superimposition of two different images—a predigital compositing technique—would still be seen in a single frame. By exposing only a portion of the film during one "take" and another portion during a subsequent "take," filmmakers could also produce the effect of a split screen. Edwin S. Porter's *The Twentieth Century Tramp* (1902), for example, used the technique of split exposure to add the New York skyline to the lower portion of the frame while the upper portion showed a "tramp" pedaling on a flying bicycle-contraption above it.[19] The title seems to pun on the double meaning of "tramp"—describing both a vagrant and an excursion by foot—and implied a wild new mobility for drifters in the new century.



5.6 Split-screen image from *Twentieth Century Tramp,* Thomas Edison Company, directed by Edwin S. Porter, 1902.



5.7 Split-screen image from *Dream of a Rarebit Fiend,* Thomas Edison Company, directed by Edwin S. Porter, 1906.

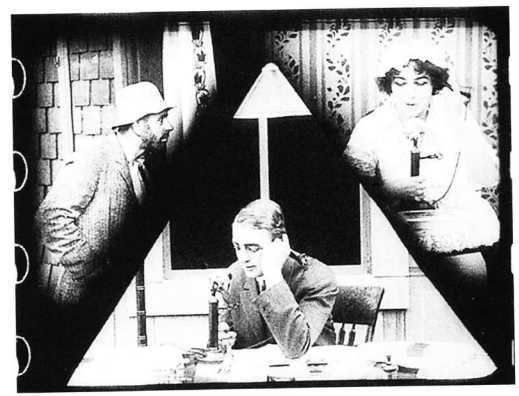
Another Edwin S. Porter/Thomas Edison film, *The Dream of a Rarebit Fiend* (1906), relied on a similar split-screen technique to indicate that the dreamer in his bed was flying over the city. Based on an episode of Windsor McCay's comic strip *Little Nemo in Slumberland, The Dream of a Rarebit Fiend* used a panoply of trick devices—superimpositions, stop-motion tricks, split-frame superimpositions—to visualize the drunken dream state resulting from overindulgence in beer and cheese rarebit. In both of these instances, the split screen was intended to help viewers visualize a fantastical world by meshing the two parts seamlessly rather than drawing their attention to the split in the frame of the shot.

Like the polyscenic painters of the quattrocento, early filmmakers could manipulate the spatial and temporal components of a single shot by using stop-action or split-frame double exposure, by layering the image into a polyscenic composite as either a directly visible or hidden effect. And as filmmakers began to have one shot follow another, the logic of shot-to-shot sequentiality—the

ordering of images one after another, not one adjacent to another—became a basic constraint of cinematic construction. Histories of film style—whether they imply an evolutionary model, or assume that the cinema developed according to its essential characteristics, or imply a relation to historical, cultural specificities—all must account for the dominance of the single-frame image.

THE MOVING IMAGE IN A SINGLE FRAME: THE SPLIT SCREEN

Edwin S. Porter used a simple two-way split screen in *The Twentieth Century Tramp* (1902) and *Dream of a Rarebit Fiend* (1906), but the split was intended to provide a seamless rend, an early instance of a compositing "special effect." In Lois Weber and Phillips Smalley's 1913 Rex film *Suspense,* the screen is visibly split into a triptych of three triangles, showing three simultaneous actions not sequentially, but within one frame. The title of the film indicates its primary narrative function: to suspend the spectator in the midst of dramatic action, uncertain of its narrative outcome. *Suspense* tells a familiar story, one quite common to one-reel threat-and-resolution narratives: a wife is home alone while her husband is off on business, and a burglar tries to break into the house. D. W. Griffith's 1909 *The Lonely Villa* has a nearly identical setup; but his one-reel narrative relied on cross-cutting—the sequential back-and-forth between several lines of action—to build suspense: the viewer watches the woman fretting inside her domestic sanctum while a menacing burglar threatens from the outside. A call to the husband, who is far from home in a third, more distant space, initiates a rush to the rescue. In *The Lonely Villa,* the viewer is literally suspended from seeing developments in one line of action while viewing the action of the "meanwhile." The telephone is used to link two separate spaces in simultaneity.[20] In contrast, in *Suspense,* instead of cross-cutting between the three spaces, Weber and Smalley chose to portray the suspenseful narrative moment within the confines of one shot, one frame.



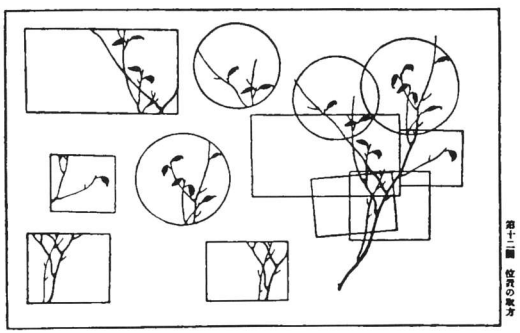
5.8 Split-screen frame enlargement from *Suspense,* directed by Lois Weber and Phillips Smalley, 1913. Museum of Modern Art Film Library.

Suspense offers an early example of the narrative function of split-screen composition. The suspense occurs across the orthogonals that divide the shot. The split screen forms a bold contrast to the perspectival agenda of representing the near and far along the axis of depth. Instead, it places the near and far

on the same spatial plane, flat and adjacent, like the moment, described by McLuhan in the epigraph at the start of this chapter, when "sequence yields to the simultaneous, one is in the world of structure and configuration."[21]

FRAMES WITHIN FRAMES

> *Doors, windows, box office windows, skylights, car windows, mirrors, are all frames. The great directors have particular affinities with particular secondary, tertiary, etc. frames. And it is by this dovetailing of frames that the parts of the set or of the closed system are separated, but also converge and are reunited.*
>
> —Gilles Deleuze, *Cinema 1: The Movement-Image*



5.9 Diagram of variable framing of branches, from Sergei Eisenstein, *Film Form: Essays in Film Theory* (New York: Harcourt, Brace and World, 1949).

Although my discussion so far has emphasized early filmmaking and the emerging conventions of moving-image representation, allow me to now turn to several contemporary French theorists who have analyzed the preponderance of frame-within-a-frame compositions. Gilles Deleuze, in his first volume of film theory, *Cinema 1: The Movement-Image*, broke the moving image into its constituent frames.[22] While Deleuze's discussion of the frame (*cadre*) and framing (*cadrage*) pivots on the polarities between the contents of the frame—full versus empty, rarefaction versus saturation—it is his discussion of the boundary of the frame that interests me here. For Deleuze, following Bergson, the frame is an "immobile section" that gives "false movement." As Deleuze notes, silent filmmakers experimented with the boundaries of the frame: "The iris method in Griffith, which isolates a face first of all, then opens and shows the surroundings; Eisenstein's researches inspired by Japanese drawing, which adapt the frame to the theme; Gance's variable screen which opens and closes 'according to the dramatic necessities,' and like a 'visual accordion'—from the very beginning attempts were made to test dynamic variations of the frame. In any case framing is limitation."[23]

Deleuze maintains that framing determines the closed system of the shot: "[I]n the final analysis, the screen, as the frame of frames, gives a common standard of measurement to things which do not have one—long shots of the coun-

tryside and close-ups of the face, an astronomical system and a single drop of water—parts which do not have the same denominator of distance, relief or light. In all of these senses the frame insures a deterritorialization of the image."[24] The container of the screen—as the master frame—translates the variables of distance and angle, light and depth, into a "common standard of measurement to things which do not have one." Deleuze supplies a catalog of films that use inset frames for dramatic effect (Fritz Lang's films *Thousand Eyes of Dr. Mabuse* and *Woman in the Window* are key examples), yet he is keen to note that these compositional framing devices or partial frames still remain within the boundaries of the screen. Deleuze's insistence that the screen "as the frame of frames" is the grand denominator of what it contains supplies profound support for an analysis of the screen as a closed visual system. As a close corollary to his attention to the frames within the master frame, his insight—"All framing determines an out-of-field [*hors-champ*]"[25]—posits a radical elsewhere, always unseen.

In a later essay, "L'écran second, ou le rectangle au carré" (The Second Screen, or the Rectangle Squared), Christian Metz also addresses the representational practice of using frames within frames: "The film presents us with a spectacle as if through a frame, door, window, etc. which is itself enframed at the same time by the rectangle of the screen."[26] The shot within a shot is a familiar figure of cinema. It plays a central role in the intrigue and continuity of certain films: at the same time, it is emblematic in the very name of these films—*Rear Window* (dir. Hitchcock, 1954), *Secret Beyond the Door* (dir. Fritz Lang, 1948), *Woman in the Window* (dir. Fritz Lang, 1944)—in which the window of the title is itself redoubled in the framing of a photograph and also in another film again; or the interior screen materializes under special variables—windshields of automobiles, a torn curtain, different demarcations of the view.[27]

Metz engages an argument made elsewhere by film theorist Marc Vernet that such secondary framing—framing within the frame—is a self-reflexive strategy engaged in the diegetization of the apparatus (*diégétisation du dispositif*).[28] While Metz's discussion is largely devoted to the compositional *mise en abyme* performed by framing devices that enact a secondary screen, he concludes his essay with a description of the use of the split screen in Brian De Palma's *Sisters* (1973), describing how De Palma deployed this technique to present the shot and its countershot simultaneously.[29]

As is evident in Metz's description of *Sisters* (and as we will see in some of the examples discussed below), the shot-countershot can occur in the same master frame in a multiple-frame, multiple-screen format. Separate "points of

5.10 Shot/countershot on two screens, from *Sisters,* directed by Brian De Palma, 1973.

view"—of seeing and being seen—can be combined, compared, placed simultaneous and adjacent. In terms of theories of suture, replacing the sequence of shot/countershot with this form of nonsequential simultaneity skews the sense that the spectator is somehow sutured into the film, between the shots.[30] While the single-screen moving image offers multiple perspectives through the sequential shifts of montage and editing, the multiple-frame or multiple-screen moving image offers the same via adjacency and contiguity.

MULTIPLICITY: A TAXONOMY OF VARIABLES

Considering the differences between the split screen (fracturing the screen within the master frame), the multiple frame (frame within a frame), and the use of multiple screens (multiplying the number of screens, often requiring multiple projection devices), a taxonomy of variables begins to emerge, each with its own historical lineage: (1) Films that use the split screen to vividly demarcate separate spaces, as exemplified in the split screens of *Suspense* (1913) and later in films such as *It's Always Fair Weather* (1955), *Pillow Talk* (1959), *Grand Prix* (1966), *Boston Strangler* (1968), *The Thomas Crown Affair* (1968), *Woodstock* (1968), and *Sisters* (1973); (2) films that use a frame-within-a-frame of a master shot or an inset screen as an element within the fictional world (a "diegetization of the apparatus") as found in examples from *Uncle Josh at the Moving Picture Show* (1902) to *Sherlock Junior* (dir. Buster Keaton, 1924) to *Purple Rose of Cairo* (dir. Woody Allen, 1985); (3) films that were projected onto multiple screens, from Abel Gance's three-projector Polyvision system for *Napoléon* (1926) to the multiscreen

exhibits of Ray and Charles Eames; Francis Thompson and Alexander Hammid's triple-screen exhibit *To Be Alive* at the 1964 New York World's Fair and their six-screen *We Are Young* at Expo '67 in Montreal; Andy Warhol's two-screen projections *Inner and Outer Space* (1965), *Lupe* (1965), *The Chelsea Girls* (1966); and other experiments at world exhibitions like Expo '67 and by experimental filmmakers Harry Smith (four-screen *Mahagonny*, 1970–1980) and Sally Potter (two-screen projects *Black and White*, 1969, and *Play*, 1971). These multiple-screen practices "expanded" cinema to venues outside of the commercial movie theater.

Experiments in screen format have occurred at critical crossroads in the history of moving-image technology. Eisenstein proposed a "dinamic screen" amid the reformulation of aspect ratio in the wake of the late 1920s transition to sound. In the early 1950s, in response to another set of economic and technological challenges to the film industry (divestiture, the commercial introduction of television), a variety of new screen formats were introduced. The expanded screen aspect ratios of Cinerama and CinemaScope challenged filmmakers to use the expanded horizontal scope of the frame. Despite the following catalog of split-screen and multiple-screen projects, these examples remain rare exceptions to dominant screen practice.

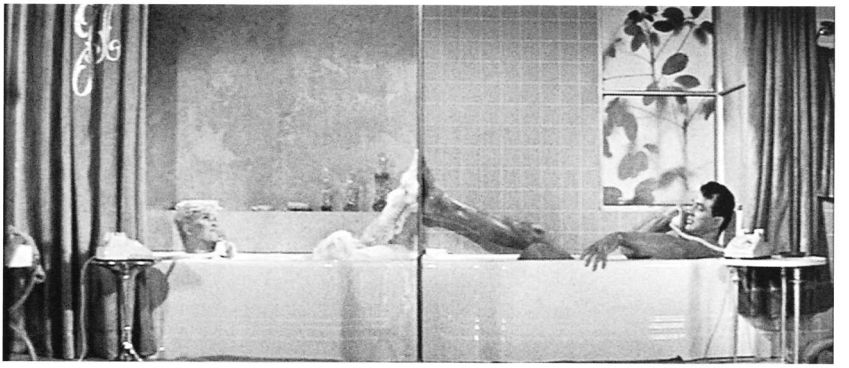
In the 1950s, filmmakers took advantage of the new aspect ratio to divide the screen into component screens. In the opening prologue of *This Is Cinerama!*, the feature-length travelogue produced for Cinerama's initial commercial demonstration in 1952, Lowell Thomas narrates a familiar teleology of motion picture history, tracing the desire to "reproduce nature" from cave paintings to magic lanterns, nickelodeons and silent movie-making. As Thomas begins his account, he is seen on a screen with the standard Academy 4:3 aspect ratio. And then, as the screen dramatically expands its format and widens to Cinerama's wider aspect ratio, Thomas announces: "This is Cinerama!"[31]

Although the patented Cinerama process involved recording with a three-lens camera and projecting with three projectors onto a concave screen, Cinerama was largely deployed for seamless continuity between the three screens.[32] With the exception of the occasional loss of registration (as in the three-legged woman who appears in Saint Mark's Square in Venice, a freak byproduct of a mistake in camera alignment), most of the film's eleven segments rely on the scope of the elongated rectangular frame to demonstrate the wrap-around immersion of the wide screen. The roller coaster at Rockaway's Playland, a helicopter trip over Niagara Falls, a bullfight in Madrid, and the canals of Venice

are filmed in three-screen registration to demonstrate the panoramic expanse of the 146-degree Cinerama screen. One sequence of the film, however, divides the panoramic display into its three constituent segments, in a manner similar to Gance's Polyvision. Set in Florida's proto–theme park, the Cypress Gardens segment exploits a three-way split of the screen. Speedboats pull "Aquabelles" and "Aquabats" on water skis through the canals of Florida's Lake Eloise in an elaborate triptych choreography. The three-screen split shows the race not in a sequential cross-cut but in multiple simultaneous juxtaposition.[33] Nevertheless, the predominant use of the three-projector Cinerama system was to hide the "seams" between each screen and give the illusion of an expansive, continuous panoramic display. As indicated in the promotional brochure accompanying *This Is Cinerama!:* "Not only has the screen a new shape and dimension, but now there are three projection booths simultaneously throwing the image on the screen—a clear, bright image that almost imperceptibly merges into one great, panoramic picture."[34]

As another example of splitting the expanded horizontal aspect ratio of the widened frame, several sequences of the anamorphic widescreen CinemaScope film *It's Always Fair Weather* (1955, dir. Gene Kelly and Stanley Donen) split the screen into a triptych. The three-way split forms the perfect analog to the film's narrative about the separation and reunion of three World War II war buddies (Gene Kelly, Dan Dailey, Michael Kidd). At the end of the war, Kelly tears a dollar bill into three pieces, one for each of the buddies. Each veteran goes his separate way. (John Belton also notes that the aspect ratio of the American dollar bill is "by strange coincidence" almost exactly the same shape as CinemaScope: 2.35:1).[35] In the musical number "I Shouldn't Have Come," Donen uses a three-way split screen to show the three protagonists as they separately regret their reunion. Like many 1950s films that addressed the threat of television by incorporating it into its plot, the final brawl is at a TV studio but seen through the windows of the control booth and in the multiple-screen display of the studio's television monitors. Whether or not, as Belton suggests, Donen's use of a three-way split screen "playfully parodies" the three camera/three projector system of Cinerama, *It's Always Fair Weather* used the single-projector CinemaScope format to fracture simultaneous action into comparative adjacent display.

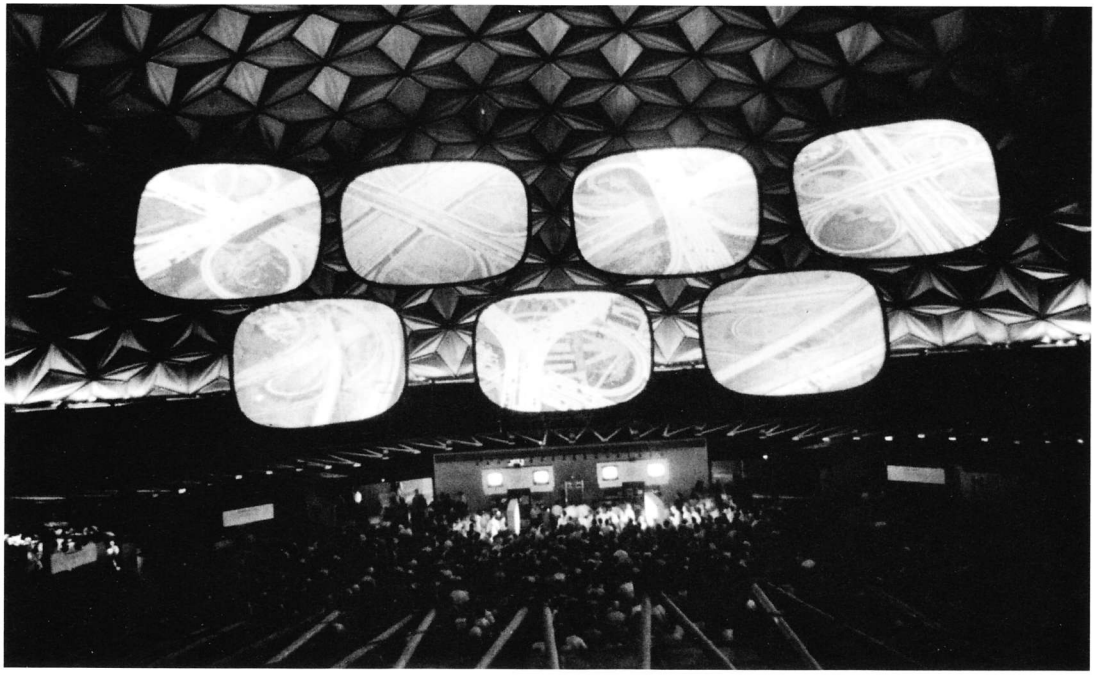
Another CinemaScope (2.35:1) film, *Pillow Talk* (dir. Michael Gordon, 1959), used a two-way split screen to establish both the separation and the connection between its two protagonists—the single career woman played by Doris Day and the playboy songwriter played by Rock Hudson. Day and Hudson share a party line; Day can't receive or make calls when Hudson is on the line romancing his many girlfriends. The screen is split to reveal their two separate habitats



5.11 Frame enlargement from *Pillow Talk,* Universal Pictures, directed by Michael Gordon, 1959.

and the telephonic link between them. In the still shown in figure 5.11, the frame edge is playfully eroticized. As Day and Hudson each recline, nude in separate bathtubs, each places a bare foot on the wall.[36] The two sections of the split screen abut in the center of the frame, and Day's and Hudson's feet touch along the boundary that separates them. As in Weber and Smalley's *Suspense,* the telephone links these separate spaces, seen here in temporal, not spatial, contiguity.

The use of the split screen for its narrative possibilities continued into the 1960s. In some cases, filmmakers were directly inspired by multiple-screen exhibitions seen at world's fairs. For the 1959 Moscow World's Fair, the U.S. Department of State commissioned designer George Nelson and the Los Angeles-based team of Ray and Charles Eames to design a multimedia exhibit on American life. The sheer number of images (2,200) displayed the abundance of life in the United States—automobiles, lawnmowers, washing machines, televisions, a plenitude magnified by the multiple (seven) screens.[37] The exhibit's coy title, *Glimpses of the USA,* suggested that, in one swift but multiplied glimpse, the United States was a land of abundant consumer durables, skyscrapers, housing projects, expansive highways, and the shiny and happy people who use them. The Eameses drew upon a repertoire of images from their database of more than 350,000 slides, and the multiple-screen presentation multiplied the impression of scale. As Beatriz Colomina has suggested, the Eameses' multiple-screen technique was organized with the logic of data compression, condensing a large quantity of information into a compressed physical space.[38] Seven twenty-by-thirty-foot screens were mounted inside an expansive geodesic dome designed by Buckminster Fuller.[39] After the success of *Glimpses* (it was seen by three million Soviet citizens and received wide critical acclaim), the Eameses received another government commission for a multiscreen (six-screen) presentation at the 1962 World's Fair in Seattle. And for the IBM Pavil-



5.12 Ray and Charles Eames, *Glimpses of the USA* (Moscow, 1959). Image courtesy of the Eames Archive, Los Angeles.

ion at the 1964 New York World's Fair, *Think,* the Eameses' multimedia paean to the virtues of the computer, increased the number of screens to fourteen.[40]

While the Eameses are certainly the best-known designers of multiple-screen visual displays, other filmmakers were drawn to this form of display. Another corporate pavilion at the 1964 New York World's Fair featured a three-screen film (18 minutes, for the Johnson Wax pavilion). Filmed on location in Africa, Europe, and the United States by filmmakers Francis Thompson and Alexander Hammid, *To Be Alive* won the 1965 Academy Award for Best Documentary Short Subject.[41] When *To Be Alive* received publicity from its Academy award, a number of feature filmmakers took inspiration from it. In 1966, John Frankenheimer, who had seen the Thompson/Hammid exhibit, used a three-way split screen for his 70mm Super-Cinerama film *Grand Prix* about the French auto race.[42] Frankenheimer and cinematographer Lionel Lindon mounted specially constructed cameras on racing cars, combined dynamic point-of-view racing footage with helicopter footage from above. Although *Grand Prix* was not projected onto multiple screens like the Thompson/Hammid project that inspired it, its tripartite split of the screen's wide-aspect ratio was a notably new narrative technique.

"EXPANDED CINEMA"

In the fall of 1965, a survey entitled *Expanded Cinema* was screened at the Film Maker's Cinematheque in New York City. "There were artists working with sound-light-multiple projections for a good ten years," wrote reviewer Jonas Mekas, "but they remained in experimental, semi-private stages until the Expanded Cinema Survey."[43] Between corporately sponsored projects for world's fair pavilions and "expanded cinema" performances that included film projection alongside other forms of light-play—slide shows, searchlights with color gels, strobe lights, mirror-balls—multiple-screen projection became a marked visual display practice of the 1960s.[44]

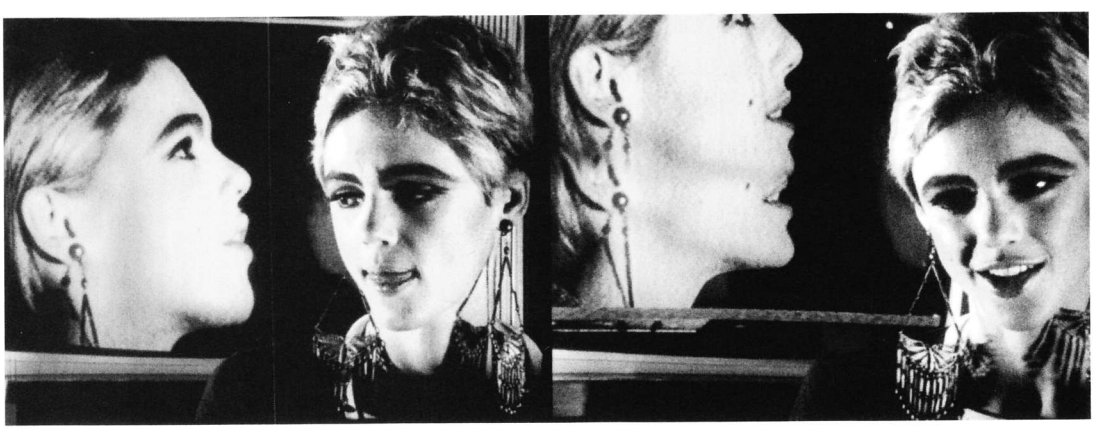
ANDY WARHOL AND THE MULTIPLE SCREEN, 1965–1966

In 1965 and 1996, Andy Warhol, whose serial painted portraits and silk-screen multiples placed repeated images in serial display, began to also place moving images in multiple array.[45] In *Outer and Inner Space* (1965, black and white, 33 minutes), Warhol doubled the frame of the film screen by placing a video screen in the shot and then doubled the frame again by projecting two reels of film side-by-side.[46] As if in a mixed-media update of Edwin S. Porter's *Uncle Josh at the Moving Picture Show,* Warhol framed his blonde superstar Edie Sedgwick in front of her framed prerecorded video image. In a clever confrontation between the two competing media formats—video/television and film—Sedgwick's image was multiplied, quadrupled, in a mirrored *mise en abyme.* In the video inset, Sedgwick is framed in profile conversing with someone just offscreen, off-frame. But within the film frame, the video monitor is placed in the back of the shot, and Sedgwick faces toward the film camera as if she is talking to someone just offscreen, off-frame. On the few occasions when Sedgwick faces the inset screen, she faces herself as if in a mirror but with a time delay. (Although the sound is at points garbled, Sedgwick's portrait is also an aural one. At points she mocks herself, mouthing her words as she hears them and sees them on the video monitor.) As portraiture, the multiplication of Sedgwick's image gives the effect of a quadrupled Edie, talking about fame and celebrity in an empty feedback loop. Warhol's title, *Outer and Inner Space,* names the complex spatial and temporal play that occurs between the outside and inside of the frame of the TV set and the frame of the film screen as it touches another screen in its multiple adjacent display. One might think that Maurice Merleau-Ponty, in his 1945 lecture on film and the "new psychology," had anticipated the philosophical gravity of Warhol's experiment: "if philosophy is in harmony with the cinema, if thought and technical effort are heading in the same direction, it is because the philosopher and the moviemaker share a certain way of being, a certain view of

the world which belongs to a generation. It offers us yet another chance to confirm that modes of thought correspond to technical methods and that, to use Goethe's phrase, 'What is inside is also outside.'"[47] In many of his films with stationary camera setups, Warhol kept his performers in the claustrophobic frame of the shot, often addressing someone, perhaps the camera operator, just off-frame. In *Blow Job* (1964), for example, the edge of the frame and the action just off-frame or off-camera become as erotically charged as the frame-line between Doris Day and Rock Hudson in *Pillow Talk*.

In another double-screen project with Edie Sedgwick, *Lupe* (1965, color, 36 minutes), Warhol has Sedgwick reenact the 1944 suicide overdose of Hollywood "Mexican Spitfire" actress Lupe Velez. As in *Outer and Inner Space, Lupe* uses the doubling of two screens in adjacent display to suggest the fractured subjectivity of Sedgwick/Velez. In a morbid forecast, Sedgwick's performance in *Lupe* mirrored her own death by overdose in 1971.[48]

Warhol's most ambitious two-screen project, *The Chelsea Girls* (1966, 210 minutes), projected twelve single-take film reels in double-screen display. Jonas Mekas describes the four-hour "epic movie-novel" filmed in the Chelsea Hotel as "a series of rooms at the Chelsea Hotel, two rooms projected side by side at the same time, with different people in different rooms, or sometimes, overlapping."[49] And although Mekas doesn't linger on this model of double-screen projection as a dollhouse in axonometric cross-section, he claims: "As the time goes, this gallery of people and lives grows into a complex human hive. The film in its complex and overlapping structure, in its simultaneity of lives before our eyes, comes closest to Joyce. Forgive me this sacrilegious comparison—really this is the first time that I dare mention Joyce in connection with cinema. This is the



5.13 *Outer and Inner Space,* directed by Andy Warhol, 1965. Image source and permission from Andy Warhol Museum, Pittsburgh, Pennsylvania.

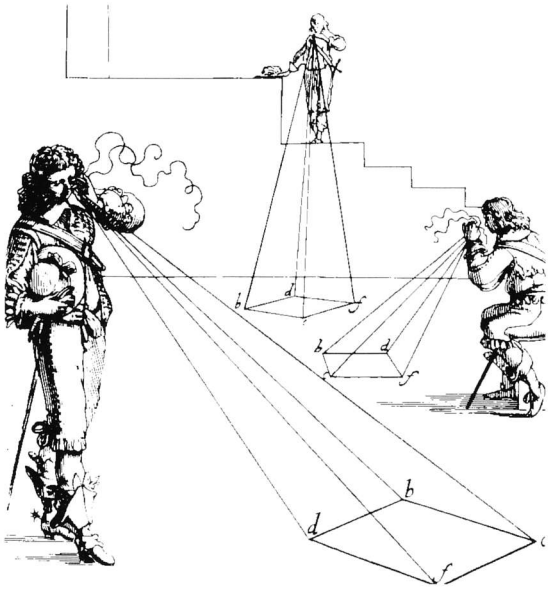
first time I see in cinema an interesting solution of narrative techniques that enable cinema to present life in the complexity and richness achieved by modern literature."[50] Warhol's double-screen projects may have been edgy because of their unexpurgated content (although perhaps not as overtly hardcore as that of *Blow Job, Couch, Harlot,* or *Vinyl*), and yet as formal experiments with the conventions of projection, they also directly challenged the cultural strictures of the single screen. Double-screen projection widened the visual field and, like the art historical double-slide projection, increased the opportunity for formal and analytic comparison. Placing two 16mm projectors side-by-side, one image would comment on the other, space was more complexly fractured, and the temporality of past and present could interact in simultaneity.[51] As Warhol quipped: "I put two things on the screen in *Chelsea Girls* so you could look at one picture if you were bored with the other."[52]

Multiple-screen projection also became a standard feature of the multimedia "light shows" of the *Exploding Plastic Inevitable* and musical performances by The Velvet Underground and Warhol's "superstar" Nico in 1966 and 1967. *EPI* performances included three to five movie projectors, slide projectors, strobe lights, and moving spotlights with color gels, creating an expanded sensorium of light, sound, and movement.[53] In their 1967 book *The Medium Is the Massage,* Marshall McLuhan and Quentin Fiore include an illustration of an *EPI* performance: a close-up of Nico's face looms as backdrop in multiple-screen projection. McLuhan's text precedes the two-page spread: "[t]he audience becomes a participant in the total electric drama" (McLuhan used the word "electric," not "electronic"): "The ear favors no particular 'point of view.' We are enveloped by sound. It forms a seamless web around us. . . . We hear sounds from everywhere

5.14 *The Chelsea Girls,* directed by Andy Warhol, 1966. Image source and permission from Andy Warhol Museum, Pittsburgh, Pennsylvania.

without ever having to focus. Sounds come from 'above,' from 'below,' from in 'front' of us, from 'behind' us, from our 'right' and from our 'left.'"[54]

McLuhan emphasizes the auditory aspects of this immersive participation, but he also incisively targets the shift from a fixed perspectival vantage to a multiple viewpoint, which could equally describe the use of multiple-screen projection: "The main obstacle to a clear understanding of the effects of the new media is our deeply embedded habit of regarding all phenomena from a fixed point of view. . . . The method of our time is to use not a single but multiple models for exploration."[55]



5.15 Drawing from Marshall McLuhan and Quentin Fiore, *The Medium Is the Massage* (New York: Random House, 1967).

McLuhan's instincts about this shift in media were rooted in his thinking about the instantaneous and continuous aspects of "electric circuitry." In the text of *The Medium Is the Massage,* McLuhan assesses a break with the deeply embedded perspective paradigm: "Since the Renaissance the Western artist perceived his environment primarily in terms of the visual. Everything was dominated by the eye of the beholder. His conception of space was in terms of a perspective projection upon a plane surface consisting of formal units of spatial measurement. He accepted the dominance of the vertical and horizontal—or symmetry—as an absolute condition of order. This view is deeply embedded in the consciousness of Western art."[56] In opposition to visual space, McLuhan placed "primitive" acoustic, horizonless, boundless, olfactory space. Although his analysis of the nonvisual aspects of the primitive seems counterintuitive, his claims about the postperspectival multidimensional models of "new media" seem prescient: "Electric circuitry is recreating in us the multidimensional space orientation of the 'primitive.'"[57]

The participant-spectators at "expanded," "exploded" multimedia performances were enveloped by sound but also bombarded by light. In a 1966 piece "More on Strobe Light and Intermedia," Jonas Mekas questioned Steven Durkee, one of the producers of the USCO "light shows," about the effect of the strobe light. Durkee commented: "*Strobe is the digital trip.* In other words, what the strobe is basically doing, it's turning on and off, completely on and completely off. . . . It creates a discontinuance so that it looks like the flicks." The invoca-

tion of the "digital trip" inspired Mekas to muse further on the subjective consequences of this lighting effect: "You become a particle, a grain of the movie. Maybe that's what it is. We are cut by strobe light into single frames, to eight frames per second or whatever the strobe frequency is, on and off. . . . *You know, we started with a simple screen and one-long-take images; then we started superimposing images; triple superimpositions; then two, three, eight screens;* single frames; superimpositions were further atomized, spiritualized by silk screens and colored veils and sound tracks. Now we've left the screen, the film and we come down to ourselves, with strobes we cut ourselves into single frames, like some symbolic or magic gesture or ritual."[58]

POLYMORPHOUS, POLYSCENIC POLYVISION: EXPO '67

In the spirit of world expositions as phantasmagorias, the pavilions of Montreal's Expo '67 displayed a wide variety of multiple-screen exhibits, with names that emphasize the expanded field of vision: CircleVision, Polyvision, Diopolyecran. Following on the success of the Academy Award–winning three-screen *To Be Alive* for the 1964 New York World's Fair, Thompson and Hammid produced the six-screen *We Are Young* for Expo '67.[59] For the "Canada '67" exhibit at Expo '67, the Canadian telephone companies commissioned a nine-projector, 360-degree CircleVision film. Recalling Raoul Grimoin Sanson's ten-projector *Cinéorama* at the Paris 1900 Exposition, CircleVision used nine projectors concealed in the space between screens to project a circular image, while twelve synchronized sound channels enveloped the audience in sound.

The most ambitious multiple-screen projects at Expo '67 were found at the Czechoslovakian pavilion.[60] Czech set-designer and inventor Josef Svoboda's "*Polyvision:* Czechoslovakia—The Automated Country" used twenty slide projectors, ten motion-picture screens, and five mobile projection screens for an eight-minute panorama of Czech industrial life. Another Czech invention, Emil Radok's Diopolyecran, a mobile multiple-screen slide show, had viewers sit on a carpeted floor facing a wall of 112 separate cubes. From inside each cube, two Kodak Carousel slide projectors projected slides onto the front of the cubes. Each cube could move into three separate positions within a two-foot range, giving the effect of the flat surface turning into a three-dimensional surface and back again. In all, there were fifteen thousand images in the eleven-minute show.

5.16 Emil Radok, Diopolyecran, Expo '67, Montreal.

In addition to the two multiple-screen exhibits at the Czech pavilion, an interactive narrative film, *Kino-Automat* (developed by cinematographer Radúz Činčera), had viewers vote on the outcome of a film narrative. Instead of random juxtaposition of multiple-screen display, the narrative linearity of *Kino-Automat* was split into branching alternatives, dependent on the majority vote.

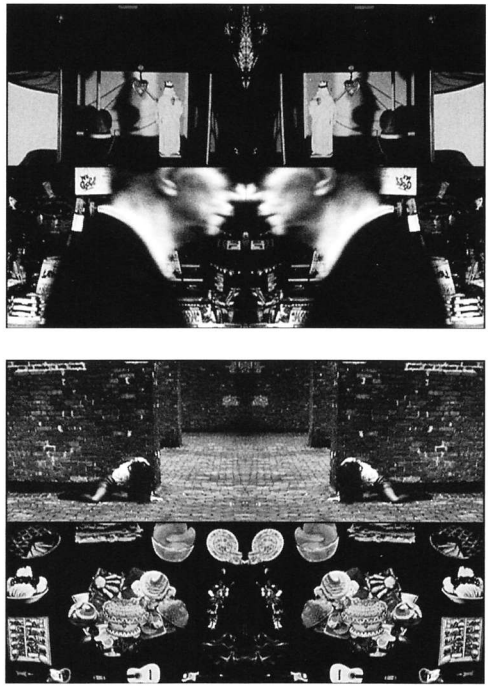
In the weeks before he began shooting *The Thomas Crown Affair* (1968), Norman Jewison took his cinematographer Haskell Wexler and editor Hal Ashby to Expo '67 to see another multiple-screen project, Christopher Chapman's *A Place to Stand.* Jewison credits Chapman's "multi-screen technique" as an inspiring model for his complex use of multiple inset screens in *The Thomas Crown Affair:* "We were trying to tell five stories," Jewison recounts, claiming "we used the multiple screen as a story-telling device . . . long before digital effects and computerized technology."[61] Another film from 1968, *The Boston Strangler* (dir. Richard Fleischer), used multiple inset screens (in different sizes and combinations) as a storytelling device. Fleischer split the screen into multiple views showing the precautions that Boston residents take—locking their doors, buying guns, walking in twos or threes at night—and to display, for example, the shot and reverse-shot of a victim at her intercom and a point-of-view shot of the intercom while she hears the strangler's voice.

As I've already discussed, Brian De Palma's *Sisters* (1973) used the two-way split-screen technique to show both shot and countershot in adjacent display. A voyeuristic neighbor (Jennifer Salt) sees a murder in an apartment across the way (à la Hitchcock's *Rear Window)* and calls the police. On one screen, we see Salt trying to convince the police to investigate, while we watch the murder being covered up on the other. In side-by-side parallel editing, by the time the police arrive, there is no evidence.

In addition to these examples from mainstream filmmaking, experimental filmmakers continued to toy with the potentials of multiple-screen projection.[62] Harry Smith's unfinished *Mahagonny* (1970–1980) was an ambitious four-projector, four-screen project. Restored in 2002, *Mahagonny* carries with it the force of some of the great *projets maudits* of the last century—Walter Benjamin's *Passagenwerk,* Sergei Eisenstein's film of *Das Kapital*—equal in its grandiose aspirations, but destined to remain incomplete.[63] As Smith declared, *Mahagonny* was "a mathematical analysis of Duchamp's *La Mariée mise à nu par ses célibataires* expressed in terms of Kurt Weill's score for *Aufsteig und Fall der Stadt Mahagonny* with contrapuntal images (not necessarily in order) derived from Brecht's libretto for the latter work."[64]

Like Warhol's *Chelsea Girls, Mahagonny* was shot in and around the Chelsea Hotel in New York City. But unlike Warhol's double-screen projects that

played with random juxtaposition, Smith's color four-screen project had a complex plan for its formal structure. Mapping his plans in charts, diagrams, and index cards, Smith deftly curated his filmed images, placing them in groups of four, each image raised to its formal exponent in relation to the others and to the soundtrack of the Brecht/Weill opera.[65] In the four-screen structure, *Mahagonny* adheres to the organizing principle of the four sides of a rectangular screen. The projection splits the rectangular frame into quadrants, with each screen becoming a picture block, a montage element poised for its combinatory power. Like the Eameses' deck of colorful still images *House of Cards* (1952), Smith's images form a building set, an encyclopedia of objects, landscapes, and portraits to be dealt in recombinant juxtapositions. Color forms a matrix, a quilt, breeding kinship and symmetries between deep reds, glaring yellows, and muted pastels. Smith had a numerological system for the four-screen organization—twenty-four shots in each reel, twelve reels, four images at a time. Images were placed in a four-image grid—top left, top right, bottom left, bottom right—sometimes paired vertically, sometimes paired horizontally, sometimes mirroring each other in bilateral symmetry. The disposition and place of each screen image amplifies its singular force; placed together, the four moving images exceed the burden of their singular frames. Smith also spatialized his montage; the cut between shots is visible across the seam of the frame line. *Mahagonny*'s structural ambitions foretold its own difficult destiny. The film was rarely projected as Smith intended.



5.17 Frame enlargements from *Mahagonny*, directed by Harry Smith, 1970–1980. Image courtesy of Harry Smith.

MULTISCREEN BUT ALSO MULTIMEDIA: VIDEO AS MEDIUM

The formal confrontation between filmic and televisual media took a variety of forms in the 1950s and 1960s. The expanded scope of the film screen was an attempt to win back viewers from the competing format of television; the split-screen fractures of the widescreen were filmmakers' strategies to more fully utilize the new real estate of the widescreen frame. In the same manner that films of the 1950s *(It's Always Fair Weather, Will Success Spoil Rock Hunter?)* took television as an object of narrative, films of the 1960s and 1970s began to use video as an inset medium. Warhol's *Inner and Outer Space* (1965) not only doubled the

screen into a two-screen projection but, in each screen, Sedgwick confronted her prerecorded video image on a video monitor placed next to her.[66] But more expansively, as video was introduced as an emerging art medium, a wide array of video artists—Nam June Paik, Bruce Nauman, Vito Acconci, Linda Benglis, John Baldessari, Bill Viola, Gary Hill, and others—used multiple monitors to experiment with the fracturing of time and the multiplication of the video image.[67] Frank Gillette and Ira Schneider's *Wipe Cycle* (1969), for example, displayed a wall of nine monitors with a mix of live broadcast, videotape, and closed-circuit shots of people in the gallery. Bruce Nauman's *Live-Taped Video Corridor* (1969–1970) placed two video monitors at the end of a narrow corridor, one on top of the other. One monitor displayed a live image from a video camera at the entry to the corridor, while the other showed a prerecorded video from the same position. Like Sedgwick confronting her video self in *Inner and Outer Space,* the two monitors enact the confrontation of video-liveness with the time shift of video playback.

Nam June Paik's playful repurposing of the video cabinet led him to new configurations for the cathode-ray monitor. Whether it be his interactive deconstruction of the video image with electromagnets in *Magnet TV* (1965) or the baring of the apparatus in *Zenith (TV Looking Glass)* (1974), Paik eviscerated the materiality of the electronic image, questioning television as a *dispositif.*[68] For *Zenith (TV Looking Glass),* Paik removed the cathode-ray tube from a Zenith television cabinet and replaced it with a Sony video camera. The set was placed in front of a window, with the camera and the empty glass monitor screen framing portions of the view outside. When a viewer looked into the monitor screen, she saw what the camera recorded facing the "window on the world," its liveness self-reflexively bared.

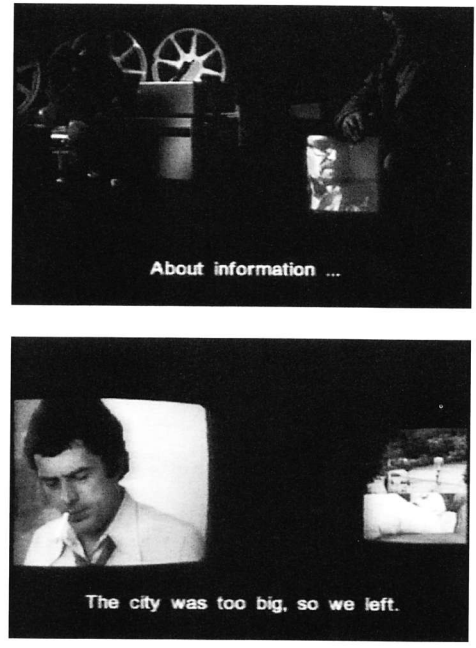
A fuller examination of video art is outside the scope of this study, but as artists and activists began to use the cathode-ray "monitor" box in single or multiple array, video entered the art world as a sculptural, time-based extension of painting in much the same ways that the kinetic aspects of film were explored by artists like Hans Richter and László Moholy-Nagy in the 1920s. Gallery-based "installation" assumed a different configuration of spectator and screen. Video monitors had, at first, the force of a signed urinal—a piece of everyday plumbing, now framed as art. More recent museum and gallery installations have freed video art from the confines of its box, with video images being projected via the beams of high-resolution data-projectors onto the wall.[69] Video—once only an "inferior cinema"—is now its brightly luminous equal. The material specificity of video—its small screen, its scanned image, its liveness—has been lost as the medium has expanded to include film, video, and

computer display in what is now referred to as "time-based media." With video projection and ever-flatter LCD or plasma screens, the video image–art form, display technology, closed circuit, broadcast, cable, or satellite program—becomes a virtual window on the wall. As Rosalind Krauss recently suggested, after several decades of video art: "[video] proclaimed the end of medium-specificity. In the age of television . . . we inhabit a post-medium condition."[70]

NUMÉRO DEUX (DIR. JEAN LUC GODARD, 1976)

In his 1976 film *Numéro deux,* Jean Luc Godard made bold use of an inset video screen. Godard placed two video screens in the black expanse of a 35mm CinemaScope frame. The two screens—one large, one small—produce a range of formal variables that enact the literal dialectic of doubling and division, flatness and depth, film and video. To make *Numéro deux,* Godard shot 16mm footage of a fictional working-class family engaged in everyday domestic activities, transferred these segments to videotape, and rephotographed the video images as they were displayed on monitors, using 35mm film. In this way, Godard could use both the techniques of film editing (in 35mm) and the video effects of key and matte overlay. Within the grand denominator of the full screen, Godard used the full panoply of possible combinations—only one small screen, both screens in dialectic display, both screens with the same image, with sync sound, nonsync sound, silence. At one point in the film, as if to suggest a zero-point of the film's style, the two inset screens contain only the static graininess of video "snow" against the empty black background of the film's frame.

Godard opens *Numéro deux* with a full-frame shot taken in the video control room of his studio in Grenoble. We see Godard standing next to a film chain, a film projector that projects directly into a video camera. In the framing of this shot, Godard's head is cropped and offscreen, severed by the frame edge, but it is resutured into the shot, appearing on the video monitor next to him in a simultaneous playback. Offscreen cinematographic space (the *hors-champ* that Deleuze writes about) is transmuted into on-screen video space. Godard is visible on both the full screen and the inset screen, controlling the production of his own image. (In fact, we are aware of Godard's presence in every aspect of *Numéro deux.* At one point, as the sync sound



5.18 Frame enlargements from *Numéro deux,* directed by Jean Luc Godard, 1976.

5.19 Frame enlargements from *Nowa książka* (New Book), directed by Zbigniew Rybczynski, 1976. Image courtesy of Zbig Vision Ltd.

is interrupted by a music track, we even hear his voice, as sound mixer, saying "merde" at this slip.) In full-blown self-reflexivity, Godard asserts control of every shot and its combination—images are not juxtaposed in a random dialectic as in Warhol's *Chelsea Girls.*[71] While Godard's use of the multiple inset screen both uses and exposes the machinery of video production, we see the video cameras and monitors, but we never see the 35mm scope camera that has filmed the film. The cinema camera remains invisible, the still mystified source of the cinematic image, but the video monitor is exposed, visible as an instant feedback loop making the reception and projection of an image simultaneous.

In *Outer and Inner Space* and in *Numéro deux,* Warhol and Godard multiplied the frame by using the video monitor as an inset medium. Not only did these films enact a formal confrontation between filmic and televisual media, they both imply the spatial context of video as the inner (domestic) space and film as the outer (public) space of reception.

In another film from 1976, *Nowa książka* (New Book), Polish filmmaker-inventor Zbigniew Rybczynski divided the screen into nine squares, each shot displaying actions in a cubist fracture of contiguous space. The film is like a puzzle: we follow various characters (a man in an orange coat, a postman in uniform, a man with a violin, a boy on a scooter) as they move from one space to another (on a bus seen from its inside, off the bus seen from its outside). The separate frames are loosely stitched together: the space of each shot is only roughly contiguous with the adjacent one. Following the movement of people through the nine separate frames, we assume that the action in each frame is occurring in real time (at one point, a sudden jolt occurs in each frame—an earthquake, perhaps) and that the separate spaces are united in simultaneous

response.[72] Like *Numéro deux, Nowa książka* was made before digital technology could aid in its filming, editing, and postproduction effects.[73]

Peter Greenaway, another filmmaker to explore the syntax of the inset frame in his films, used video effects to produce multiple-screen images, letterboxed frames, overlaid texts, and writing superimposed on images. In *Prospero's Books* (1991) and *Pillow Book* (1996), Greenaway was an early adopter of digital technology for postproduction special effects. A history remains to be written of the accretion of digital minutes invading film and television production, leading to the "born digital" films of the present.

THE DIGITAL MOVING IMAGE: MULTIPLE IMAGING AND DISPLAY

> *Digital cinema offers formal solutions to "tense" limitations of mechanical cinema. Past, present and future can be spoke in the same frame at once.*
>
> —Gene Youngblood, "Cinema and the Code"

As evidenced in the 1966 discussion between Steve Durkee and Jonas Mekas, the concept of the "digital" began to creep into discourse about representation and experience in the mid-1960s, but it had not yet figured as a technology for image production or postproduction. Here, a taxonomic question remains an important one. At what point did the specificity of "film" as a medium become irreparably altered by digital technology? In a slow accretion since the first use of computer-generated images (was it the infrared point of view of Yul Bryner's gunslinger in *Westworld* in 1973?) to the growing number of on-screen minutes given over to CGI (culminating perhaps in *Toy Story* [1995], the first CGI feature-length animation) to *Sky Captain and the World of Tomorrow* (2004, the first film with all-CGI background and live actors)—film has become its digital other. *Sky Captain and the World of Tomorrow* was born on hard drives, developed on microchip, with no sets, no locations, only the blue screen. Like a James Turrell light box, the blue screen is the foundation for a new screen reality.

TIME CODE (DIR. MIKE FIGGIS, 2000)

In *Time Code,* Mike Figgis's four-camera digital video project, the screen is split into quadrants. For a deftly choreographed ninety-three minutes, starting at 3 PM on November 19, 1999, on Sunset Boulevard near the Los Angeles bookstore Book Soup, four hand-held digital video cameras followed four separate "lines" of action. Each camera filmed in "real-time" in one ninety-three-minute-long, unedited take.[74] In the final film, the four camera views are shown in four

screens, quadrants of a full-size movie screen. The action—although in real time—is fictional, acted and loosely scripted. For the viewer, each quadrant displays simultaneous but not sequential action, a flattened fracturing of a moment into four "perspectives." As in *Suspense* (1913), *It's Always Fair Weather* (1955), *The Boston Strangler* (1968), *Sisters* (1973), and *Numéro deux* (1976), the sequential spatiality and cross-cut temporality of single-screen film-making has been replaced by simultaneous nonsequential display.

As the film commences, each quadrant of the screen starts up sequentially: first, in the top right, a close shot of a woman (Saffron Burrows) in a therapy session; second, in the upper left, Lauren (Jeanne Trippelhorn) scampers out to a parked BMW to let the air out of the tires; third, in the lower right, a massage therapist arrives at the offices of a film production company. The lower left screen shows the fractured screens of video surveillance. At first, we are not certain of the spatial relation between these screens, whether they are contiguous or distant. Like the other split-screen films I've discussed, *Time Code* links its spaces with telephonic simultaneity. In one scene, Kyle McLachlan is on the phone with Alex (Stellan Skarsgard) inside the offices while Lauren sits in her stretch limo outside listening to an audio-bug she has placed in the bag of her lover, Rose (Salma Hayek). McLachlan is seen through the back window of the limo, framed in the deep space of one shot, while on another screen, he is seen from the front. The four separate screens abut each other. Characters from one screen may wander into the space of another, seen from two perspectives. Another indication that the four screens are all displaying simultaneous lines of action occurs when an "earthquake" conjoins the separate screens as we suddenly react to the jolt. Figgis has projected the film with a variety of sound mixes, changing the level of priority of sound and image.[75]

5.20 Frame enlargement from *Time Code,* directed by Mike Figgis, 2000.

The *Time Code* website declared: "Technology has arrived. Digital video has arrived. For the first time, a film shot in real time. Who do you want to watch? A story that could only be told in four dimensions."[76] Despite the assumption that even in multiple display one watches only one screen at a time, we actually watch all of the screens at the same time. Rather than demonstrate our split attention, the film demonstrates our ability to follow all four screens.

The multiple-screen idiom has taken hold in the world of video art as well: Sam Taylor-Wood's seven-screen piece *Third Party* (1999) peels away the dynamics of a cocktail party by filming the event with seven cameras in real time and projecting with seven 16mm projectors; Isaac Julien and Javier de Frutos's *The Long Road to Mazatlán* (1999), a triple DVD projection, plays with a full panoply of formal variables of the triptych split of images; and French artist Pierre Huyghe's double-screen piece *The Third Memory* (2000) parallels excerpts from Sidney Lumet's *Dog Day Afternoon* with Huyghe's own film of the bank robber, John Woytowicz, thirty years later, reenacting the crime with actors on a set.[77] Iranian artist Shirin Neshat uses two screens in a trilogy of films, *Turbulent* (1998), *Rapture* (1999), and *Fervor* (2000), to vividly convey the rigid divisions in gender between Iranian men on one screen and Iranian women on another.[78] Doug Aitken's *Electric Earth* (2000) used three rooms with multiple screens to display his protagonist's stroll through the electric landscape of a Los Angeles night; Christian Marclay's four-screen *Video Quartet* (2002) combines component clips from hundreds of movie scenes depicting musical performances;[79] and in Barbara Kruger's *Twelve* (2004), the artist installed four screens in the Mary Boone Gallery to surround the gallery viewer—each screen has a close shot of a dining scene as a text band crawls along the bottom of the screen.

For contemporary artists who experiment with the representational possibilities of flat-screen digital video, the multiple-image, multiple-frame, multiple-screen format has become an accessible new idiom.[80] Filmmaker Julie Talen writes: "There's an unnamed satisfaction in stretching this newfound ability to navigate through images. We're actually hungry to use this ability, to feed it with something more substantive than frenzied Web animations and stock tickers. We crave stories. The single-channel film is the visual art form of the gaze; multi-channel is the art form of the glimpse."[81]

THE COMPUTER SCREEN AND ITS "WINDOW"

> *In front of him was the display screen. The large screen behind him could alternate between, or share, multiple views of Doug's hands, his face, the information on the display screen, and images of his colleagues and their display screens at Menlo Park. The screen could be divided into a number of "windows," each of which could display either text or image. The changing information displayed on the large screen, activated by his fingertip commands on the five-key device and his motions of the mouse, began to animate under Doug's control. Everyone in the room had attended hundreds of slide presentations before this, but from the moment Doug first imparted move-*

ment to the views on the screen, it became evident this was like no audiovisual presentation anyone had attempted before.

—Howard Rheingold, *Tools for Thought,* an account of Douglas Engelbart's demonstration at the Fall Joint Computer Conference, San Francisco Convention Center, December 9, 1968

In the 1960s, as filmmakers explored split- and multiple-screen formats, as the media of video and film began to interact as production formats, there were, at first, only subtle changes to vernacular screen media. But as the "personal computer" began to invade daily life, a new "interface" to the screen began to produce new modes of cinematic, television, and video display.

The graphical user interface (now synoptically known as GUI) has changed the way we use and imagine computers. Computing mechanisms were first room-sized mainframes, then faceless beige boxes. As they acquired display screens, the computer supplied a new "interface" with its user. "Interface"—a geometric term for the surface that forms the common boundary between two three-dimensional figures—was deployed to describe the human-computer relation once the user was literally "facing" the computer. In this way, the user's relation to the computer screen can be measured in terms that we've used for other screen formats—the representation of flatness and depth, the use of the frame, the assumed "point of view" of the viewer, etc. The metaphor of the window, so overdetermined by the connotative drag of its cultural heritage, quickly entered into the terminology for computer operating systems, as an inevitable component of computer "architecture."

But here, as we enter into the discursive terrain of computers and computing, it will become apparent that an entirely different set of terms and philosophical assumptions are at play. Computer operating systems also rely on metaphor, as if we can imagine the future only in the familiar language of the past. Metaphors, of course, are already translators. Metaphors substitute one thing for another, performing an alchemy from a material referent to the immaterial tissue of language. But computer metaphors are not just descriptive figures, aloft in language; they are integral to the conversion of binary bits of information into words and images. A computer metaphor acquires near-materiality as a *virtual* object.

In the history of computing devices, the use of metaphor became a direct component of the graphic display screen. In *Interface Culture* (1997), Steven Johnson eloquently details the ways in which the graphical user interface transformed the spatial imagination. Johnson convincingly argues that visual metaphors (of the desktop, the window, but also of the personal assistant, shopping

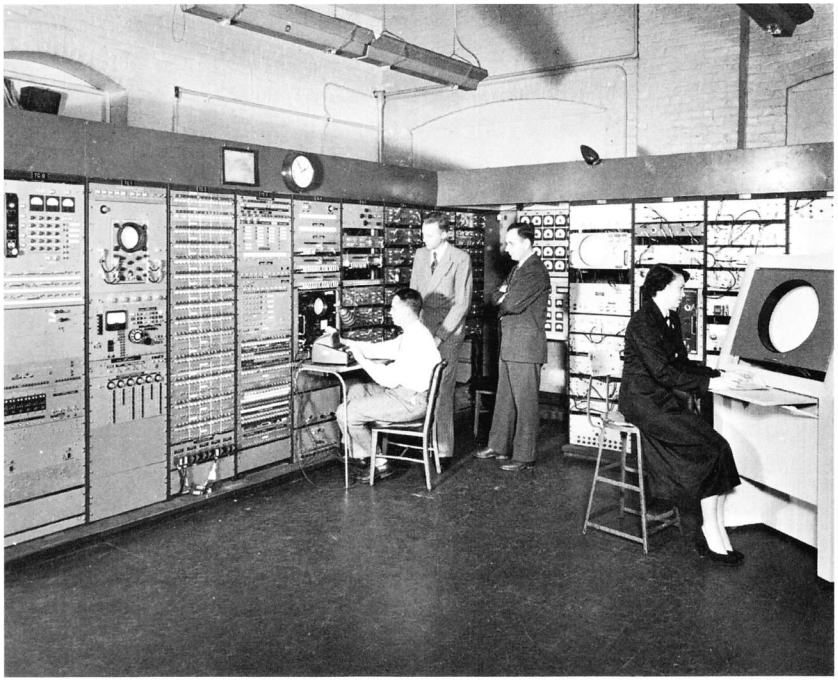
mall, town square, and living room) have served as key cultural accommodations to a "digital revolution" and to an interface with a new "space" of information.[82]

The earliest computing devices—Blaise Pascal's calculator, the Pascaline (1642), and Charles Babbage's Difference Engine (1820)—were brass instruments crafted with the same precision mechanics of clocks, watches, and automata. One can easily imagine the user's engagement with such intricate pieces of design. These early computing apparatuses were prosthetic devices, offloading the calculations of the human brain to the delicate workings of a machine. As the machinery of computing grew to room-sized mainframes, the human user was dwarfed by the sheer scale of the machine. Contact with these gargantuan machines became an awkward interaction via knobs and dials, plugs and circuits, punch-tapes and punch-cards.

One way to conceptualize the changing "interface" with computing machinery is to consider the barriers between humans and machine. John Walker, founder and CEO of the computer design company Autodesk, charts five successive "user interaction generations" in terms of the intermediaries placed between the human and the computer: front panel, countertop, terminal, menu, screen.[83] In Walker's account, the "first generation" was clumsy but direct: "the user went one-on-one with the computer, in the computer room, operating the computer at the switch and knob level. Since the user was the operator of the machine and controlled it with little or no abstraction, there was essentially no mediation between the computer and its expert user."[84]

In the rapid set of technological changes that led to the advent of the personal computer in the early 1980s, the acquisition of a display screen as the visual

5.21 Frame enlargement from *Desk Set*, 1957.



5.22 MIT Whirlwind, 1951.

interface with a computing mechanism and the switch from alphanumeric "command lines" to a screen with icons and images were the two key developments that brought the computer closer to the other predominant forms of visual imaging.[85] Add an Internet-enabled World Wide Web to this graphic-display screen, and the computer window opened itself to convergences with the cinema and television screen.[86]

In 1951, the Whirlwind, an Air Force-funded military computer at MIT, used a circular CRT screen equipped with a light pen and a keyboard for input into its mainframe. Modeled directly on a radar screen, the Whirlwind's CRT screen was more of a porthole than a rectangular frame.[87] Although the screen served as a surface for entering information into a large mainframe, it was, as is apparent in figure 5.22, one of several means of input at the front panel of the massive device.

The image quality of radar monitors and early computer CRT screens, far from the pixels of today's display, was not sharp enough or bright enough to display details of characters and fonts.[88] When, as a researcher at the Stanford Research Institute, Douglas Engelbart first hooked video terminals to computer mainframes, his specially designed monitors had small, fuzzy black-and-white screens.

The exact origin of the first use of the term "window" as a metaphor for an inset framed section of the computer screen is difficult to pinpoint. Douglas Engelbart may not have used the exact term "window" to describe his multiple-screen "TV approach" to the computer interface, yet his "Augmented Human Intellect Study" contained a prototype for the form. In a 1962 project description, "Augmenting the Human Intellect? A Conceptual Framework," Engelbart declared his Enlightenment goals for the computer: "By 'augmenting human intellect' we mean increasing the capability of a man to approach a complex problem situation, to gain comprehension to suit his particular needs, and to derive solutions to problems."[89] As Engelbart summarized some of the conclusions to be drawn from his study: "We see the quickest gains emerging from (1) giving the human the minute-by-minute services of a digital computer equipped with computer-driven cathode-ray-tube display, and (2) developing the new methods of thinking and working that allow the human to capitalize upon the computer's help."[90]

To illustrate computer-aided "intellect augmentation," Engelbart supplies an example that uncannily draws us back to Alberti and his 1452 architectural treatise *De re aedificatoria* (On the Art of Building). Engelbart imagines an architect designing a building at a computer workstation. The system imagined has "a visual display screen some three feet on a side" which is his "working surface." The display screen is controlled by a computer ("his 'clerk'") that the architect runs "by means of a small keyboard and various other devices." Engelbart describes the architect's work process, which begins with a "perspective view": "he has just coaxed the clerk to show him a perspective view of the steep hillside building site with the roadway above, symbolic representations of the various trees that are to remain on the lot, and the service tie points for the different utilities. The view occupies the left two-thirds of the screen. With a 'pointer,' he indicates two points of interest, moves his left hand rapidly over the keyboard, and the distance and elevation between the points indicated appear on the right-hand third of the screen."[91] The "perspective view" occupies only a portion of the screen; the other portion displays specifications of distance and elevation. As the architect's work proceeds, he enters specifications for the building using a keyboard and pointer: "Now he enters a reference line with his pointer, and the keyboard. Gradually the screen begins to show the work he is doing (a neat excavation appears in the hillside) revises itself slightly, and revises itself again. After a moment, the architect changes the scene on the screen to an overhead plan view of the site, still showing the excavation."[92] The perspective view—undifferentiated from its Renaissance forebear—shifts with the stroke of a finger to an overhead view. The imagined depth of the screen surface, deep toward a vanishing point at one moment, shifts

to the flat surface of the view from above. Prior to Renaissance perspective, painterly representation did not imply a singular fixed point; the view was from both above and below. While the exact details of the screen and its component portions are not described in Engelbart's 1962 proposal, his intentions for what he would call a "TV approach" to a multiple-screen display are prototypically clear.

Engelbart worked on this interface through the mid-1960s, but his ninety-minute multimedia demonstration of networked computing at the Fall Joint Computer Conference in San Francisco on December 9, 1968, was to the computer window what the Lumière brothers' December 28, 1895, showing at the Grand Café was to the cinema: it provides a dramatic markable date, more symptomatic than exact, and only to be qualified by corrections and exceptions.[93] Film historians debate the "first" public projection of moving images: was it the Lumière brothers' scientific demonstration in March 1895, or their December 1895 showing at the Grand Café; or the November 1895 public projection by the Skladanosky brothers at the Winter Garden in Berlin? Equally, the computer graphic display window was demonstrated in a variety of venues, all of which are described with a dramatic weight equivalent to the writing of protocinematic history—Engelbart's 1968 display at the Fall Joint Computer Conference, Charles P. Thacker's April 1973 demo of the Alto at Xerox PARC, Steve Jobs's 1979 visit to Xerox PARC, the 1984 Super Bowl ad that introduced the Apple Macintosh.

In the report that accompanied the 1968 demo, Engelbart describes the components of his display system. He emphasizes the limitations of the system (he used small black-and-white CRTs), but also defends the cost features of this "TV approach":

> *5c3a* The display systems consists of two identical subsystems, each with display controller, display generator, 6 CRT's, and 6 closed-circuit television systems.
>
> *5c3b* The display controllers process display-command tables and display lists that are resident in core, and pass along display-buffer contents to the display generators.
>
> *5c3c* The display generators and CRT's were developed by Tasker Industries to our specifications. Each has general character vector plotting capability. They will accept display buffers consisting of instructions (beam motion, character writing, etc.) from the controller. Each will drive six 5-inch high-resolution CRT's on which the display pictures are produced.

5c3c1 Character writing time is approximately 8 microseconds, allowing an average of 1000 characters on each of the six monitors when regenerating at 20 cps.

5c3d A high-resolution (875-line) closed circuit television system transmits display pictures from each CRT to a television monitor at the corresponding work-station console.[94]

Engelbart does not use the term "window" in this description of the 1968 demo—only the retrospective accounts do. In Howard Rheingold's description of Engelbart's 1968 show, for example, Rheingold uses the word: "The screen could be divided into a number of 'windows,' each of which could display either text or image. The changing information displayed on the large screen, activated by his fingertip commands on the five-key device and his motions of the mouse, began to animate under Doug's control."[95] It is not clear whether the term "window" was actually used at SRI or whether now, in recovered memory, the inset screen was believed to always already have been a window.

But after Engelbart's demo, there is a clear instance in which the window metaphor was invoked. In his 1969 dissertation at the University of Utah, Alan Kay described a graphical "object orientation system" that had "VIEWPORTS" and "WINDOWS."[96] The figure of a "viewport" is only slightly different from a window and could equally have become the proprietary trademark. Both imply an aperture, a visual porthole onto the graphic expanse of a screen that simultaneously represents and masks the workings of the computer's code. In this form of "object-oriented" programming, anything could be an object—a number, a word, a picture—and hence it was assumed to be a multimedia display. Kay imagined the computer as just such a metamedium able to incorporate other media, a convergence device waiting to happen.

As computer operating systems were developed through the 1970s and into the 1980s and as the "personal" computer was marketed as a consumer appliance, the use of a screen was not an immediately apparent advance. While other contemporaneous developments (the military roots of ARPANET and the eventual Internet) were expanding the potentials of networked communication, the emerging conventions for computer display took place in the laboratories of corporate research and development.[97]

In April 1973, the Alto computer was demonstrated to a group of researchers at Xerox PARC. The Alto's eight-and-a-half-by-eleven-inch CRT screen displayed an "animated test pattern" of the *Sesame Street* character Cookie Monster in digital ones and zeros. The computer screen was "bit-mapped," given a face

but not yet a window. The Alto was an in-house computer at PARC, not released to the market. But the competition with old media was clear; to viewers accustomed to 70mm widescreen films and colorful high-resolution television images, the computer display was still a dim relative.

The Alto screen was shaped like an upright letter-sized piece of paper, so the implicit metaphor of this interface was that of typing onto a page. Other members of the PARC group were developing crucial components of what would become a display screen with inset "windows."[98] In 1975, Dan Ingalls wrote a display algorithim that provided the means to move whole rectangles of bitmap from one location to another. "BitBlt" (an abbreviation for bit boundary block transfer) became the root algorithim for overlapping "windows": part of the screen could be hidden by a block that appeared on top of it, as if the screen display had layers. Not only could the screen be divided into separate movable inset frames, but each one could run a different application—one displaying a text program, one filled with pure code, one with a drawing. The overlapping window changed the metaphor ever so slightly. The surface windowpane now had depth and defied gravity, since windows could also be stacked. The user would manipulate from a position as if in front and also above. The window interface did, however, rely on the idea of a dynamic square—a resizable, dragable, motile frame, with a scroll bar to navigate within its boundaries. The computer window is like a screen where the contents move but the frame stays stable.

The graphical user interface developed at Xerox PARC emphasized the metaphoric nature of computer usage—"mice" that scurry under our fingers at the fluid command of wrist and palm; "desktops" that defy gravity and transform the horizontal desk into a vertical surface with an array of possible documents and applications; "icons" that represent objects or, more exactly, object-oriented tasks. This interface became known as the WIMP interface—Windows, Icons, Mouse, Pull-down Menus.[99]

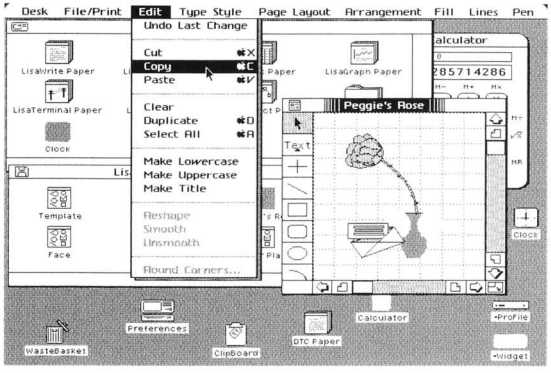
The bitmap screen introduced a new layer to the user interface. In the graphic interface, the user directly manipulates a *virtual* version of what she intends to command—the user selects, drags, drops, opens, closes, copies, deletes, puts in the trash. The user can see the documents and applications on the "desktop" and in the "windows" of the screen. By contrast, the user of the "command line" interface may be "conversing" with the computer, giving it commands to perform a task, but she must speak to it in its code. Instead of translating a three-dimensional material world to a two-dimensional virtual representation as painters and photographers and filmmakers have done, the bitmap computer display constructs its virtual world entirely from digital infor-

mation. The bitmap screen performs a different translation: from the nondimensional immateriality of bits to a visual (graphically iconic) mapping of metaphor onto the virtuality of a two-dimensional screen.

The computer "window" referred to any enclosed, rectangular area on a display screen. In a 1982 book *Principles of Computer Graphics,* the "window manager" and the term "window" were nonproprietary idioms: "Many system and user programs on the ALTO employ a *window manager* to control multiple, typically overlapping windows, i.e., areas on the screen in which a page or piece of a page may be displayed. Each window is in essence a variable-size virtual screen that reflects the progress of some activity. The general effect is one of looking at a small desk with papers of varying size lying partially on top of one another."[100] The "window" here refers to a "variable size virtual screen" but is also a component of a mixed metaphor: a window and a desk. The desktop metaphor of a stack of papers, in overlapping array, implies a view from above. The window metaphor implies looking into or out of an aperture, a "perspective" position facing an upright perpendicular surface. Stacking windows on top of each other, piling documents in layers, meant that the user could maximize the limited "real estate" of the relatively small screen. The space mapped onto the computer screen was both deep and flat. It implied a new haptics in the position of its user: in front of and above.

The window-based interface allowed the user to open more than one window, introducing the concept of multiple tasks, applications, views to the computer user. "A computer is just one machine," writes Yale computer scientist David Gelernter, "a screen is a single plot of real estate, but windows allow you to create as many communication channels as you choose between yourself and your running program."[101]

In December 1979, Steve Jobs—the twenty-four-year-old cofounder of Apple, the manufacturer of Apple I and Apple II personal computers—visited Xerox PARC. Apple II and Commodore home computers both were configured to use TV screens as monitors. The 1981 IBM PC used a monochrome CRT screen but not GUI display. Retelling the import of Jobs's tour of Xerox PARC with the full narrative intrigue of industrial espionage, Michael Hiltzik describes Jobs's visit as a "daring raid."[102] (According to another writer, Jobs traded $1 million in stock options in Apple for the visit.)[103] At Xerox PARC Jobs saw the graphical user interface used on the Alto and the Star. The GUI-run Xerox Star was introduced to the market two years later, in 1981, but its price was too high for the home computer market. Jobs used both the Alto and the Star as models for the 1983 Apple Lisa,[104] the first *personal* computer with GUI. Although the Lisa



5.23 Screen shot of Apple Lisa, 1983.

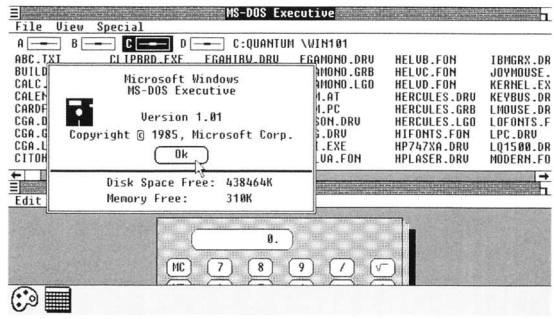
didn't sell well (it was priced at $9,995 and aimed at the business market), Apple's next product was introduced less than a year later, with a dramatic ad campaign that drew its strength from the historical confluence of anti-Soviet cold war rhetoric and the Orwellian year, 1984.

In a now-historic sixty-second spot, placed during half-time of Super Bowl XXL on January 22, 1984, Apple unveiled its new computer, the Macintosh.[105] The ad, produced by Los Angeles-based ad firm Chiat/Day and directed by *Blade Runner* director Ridley Scott, opened onto a monochromatic future city connected by tubes full of conformist worker drones marching as if in robotic obedience to unseen commands. They march in lockstep into a large auditorium where a Big Brother preaches in monotones from a giant TV screen. Suddenly a lone woman, in a white tanktop and red running shorts, bursts into the auditorium and sprints down the center aisle carrying a large hammer. She runs at the screen and tosses the hammer toward it, shattering it with a blaring explosion of light as the voice-over announces: "On January 24th, Apple Computer will introduce the Macintosh. And you'll see why 1984 won't be like *1984*." With this dramatic introduction, the Apple Macintosh triggered what Neal Stephenson deemed a "sort of holy war in the computer world."[106] The Macintosh, priced at a much more reasonable $2,495, was a personal computer with an operating system based on graphic display instead of the "command line" interface.

PROPRIETARY WINDOWS

In his 1995 memoir, *The Road Ahead,* Bill Gates recalls the transition from the command line to graphic interface. Gates describes his intention, as early as 1983, to develop graphical interface and to abandon MS-DOS: "Our goal was to create software that would extend MS-DOS and let people use a mouse, employ graphical images on the computer screen, and make available on the screen a number of 'windows,' each running a different computer program."[107] In Gates's account, the other two personal computer systems that had graphical interfaces in 1983, the Xerox Star and Apple Lisa, were proprietary and expensive: "Microsoft wanted to create an open standard and bring graphical capabilities to any computer that was running MS-DOS."[108] Despite the rhetoric of

an "open standard," Microsoft attached a proprietary trademark to the term "window" and in November 1985 introduced graphical computing to IBM PCs (and their "clones") with a product called Windows 1.0. In the fall of 1987, Windows 2.0 added icons and resizable, overlapping windows. The software war had begun. In 1988, Apple sued Microsoft for copying the "look and feel" of the Macintosh's graphic display, but the term "windows" now belonged to Microsoft as Windows.™[109] By 1993, Windows 3.0, which was released in 1990, had sold 25 million copies. And as the media-saturated campaign for Windows 95 emphasized, by the end of its first decade, Microsoft's Windows became the most widely used operating system.[110] As David Gelernter writes: "Pushing beauty instead of old-fashioned DOS ugliness, Microsoft emerged as the uncontested leader of the desktop computing world."[111]



5.24 Screen shot of Windows 1.0, 1985: windows are "tiled" and cannot be overlapped.

Like the Mac OS, the "interface" of Windows extends screen space by overlapping screens of various sizes; each "window" can run a different application; the user can scroll through a text within a "window," arrange "windows" on the screen in stacked or overlapping formations, decorate "windows" (with wallpapers, textured patterns), and conduct new forms of "window shopping."[112] The "windows" trope is emblematic of the collapse of the single viewpoint; it relies on the model of a window that we don't see through, windows that instead overlap and obscure, and are resizable and movable.

Consider the following shift in discourse from the Albertian metaphor. *Webopedia,* an online dictionary of new media terms, defines "window" as distinctly polyscenic:

> An enclosed, rectangular area on a display screen. Most modern operating systems and applications have graphical user interfaces that let you divide your display into several windows. Within each window, you can run a different program or display different data.
>
> Windows are particularly valuable in *multitasking environments,* which allow you to execute several programs at once. By dividing your display into windows, you can see the output from all the programs at the same time. To enter input into a program, you simply click on the desired window to make it the foreground process.[113]

> *Why are we rejecting explicit word-based interfaces, and embracing graphical or sensorial ones—a trend that accounts for the success of both Microsoft and Disney?*
> —Neal Stephenson, *In the Beginning Was the Command Line*

Before Microsoft adopted a graphical user interface for its Windows operating system, the "holy war" between the MAC and the MS-DOS "command line" interface was described by Umberto Eco as a struggle between Macintosh/Catholicism ("the essence of revelation is dealt with via simple formulae and sumptuous icons") and MS-DOS/Protestantism ("To make the system work you need to interpret the program yourself: a long way from the baroque community of revelers, the user is closed within the loneliness of his own inner torment").[114] The religious war between a command line and a graphic display interface pitted the word and the text against the image and icon.

In his polemical treatise *In the Beginning Was the Command Line* (1999), cyber-novelist Neal Stephenson rails against a growing global "interface culture," a monoculture with a computerized visual interface.[115] Stephenson compares the Macintosh and Windows interface: the Macintosh is "not only a superb piece of engineering but an embodiment of certain ideals about the use of technology to benefit mankind," while Microsoft's Windows equivalent is "a pathetically clumsy imitation and a sinister world domination plot rolled into one."[116] And yet, despite the competition between the Mac and Windows operating systems, Stephenson holds both systems accountable for millions of computer users becoming accustomed to a graphical interface.[117]

By mapping code onto a graphic display, the GUI interface conceals its workings, hides its code. In Stephenson's account, the graphical interface "introduced a new semiotic layer" between human and machine: "GUIs use metaphors to make computing easier, but they are bad metaphors."[118] Stephenson compares this to the Disney model of "putting out a product of seamless illusion." (Stephenson's diatribe carries with it an implicit critique of icon-based graphics as reductive cartoons.) In this way, both the Mac and Windows operating systems are in the same business: that of "short-circuiting laborious, explicit verbal communication with expensively designed interfaces."[119] Alternatively, Stephenson champions the Linux operating system because its workings are exposed and it can be customized by its user, like a tuner-car. An obvious analogy occurs here: both the Mac OS and Windows interface operate like classical Hollywood film style—concealing its workings, aiming for unreflexive illusionism—while the Linux OS operates more like an independent or avant-garde

film, self-reflexive, its substrates and premises exposed. The Linux OS is computing with distanciation, as if it were an operating system designed by Bertolt Brecht. But Stephenson's polemic holds a prescient command of the global effects of interface culture, for GUIs have become the "meta-interface" found on almost any screenic device—VCRs, cell phones, car navigational systems, gaming consoles, and my favorite new screen-enabled appliance, the Samsung "Internet refrigerator."[120]

While the scale and domestic place of the television may have prepared us for the screens of the "personal" computer, computer "users" are not spectators or viewers. Immobile, with attention focused on a screen, the "user" interacts directly with the framed screen image using a device—keyboard, mouse, or in the case of touch-screens, finger—to manipulate what is contained within the parameter of the screen. Computer interfaces may have been designed to become dyadic partners in a metaphysical relationship, but complaints about the awkwardness of this liaison have targeted the interface. Brenda Laurel proclaims: "Using computers is like going to the movie theater and having to watch the projector instead of the film."[121]

OLD METAPHORS, NEW SCREENS

For Alberti, the metaphor of the window implied direct, veridical, and unmediated vision, transparency of surface or aperture, and transmitted light. The computer "window" implies its opposite: the visual field seen through a computer "window" is rarely direct (although webcams play on this function); it is mediated to a high degree through its proprietary or trademarked "software"; and its representational function is highly iconic. Computer "windows" coexist on the flat surface of a computer display. They open onto flatness or depth, image or text, moving or still content. Some "windows" open onto networked systems, some only refer to the hard drive of its base. Although computer "windows" can be "open" at the same time, they rarely serve, as the art historical double-slide projection did, as a means for comparative analysis.

So let's consider the computer user who navigates the "windows" of screen space. In the mixed metaphor of the computer screen, the computer user is figuratively positioned with multiple spatial relations to the screen. "Windows" stack *in front of* each other (if one is looking into the screen perpendicularly, as if through a window) or *on top of* each other (if one is looking into the screen as if its perpendicular is in a gravity-defying ninety-degree rotation of an angle overhead). As either a "page" or a "window," a mobile switch of position is implied in the mixed metaphor: the user switches between a recumbent (desktop view) and an upright (window) view. The desktop metaphor implies

background and foreground layers, but seen from above. The gravity-defying space of the computer screen accustoms us to the antigravity of CGI in films such as *Crouching Tiger, Hidden Dragon,* and *The Matrix.* The computer user may switch back and forth between these layers, open and close "windows," switch activities at will. The user may not be able to see each "window" in the stack on the desktop, but this doesn't mean the program isn't there or is no longer active. The computer may be "thinking" about several things at once, it may have several applications open, different programs running in separate "windows."

Of course, the icons of the graphical user interface are reductively simple, far from high art, farther even from the screens of popular culture. The Microsoft version of the window interface did not even draw on the "deep beauty" that David Gelernter finds in software that is "simple and powerful."[122] And yet, on the fractured plane of the computer screen, the metaphor of the window has retained a key stake in the technological reframing of the visual field. The Windows interface is a postcinematic visual system, but the viewer-turned-user remains in front of (*vorstellen*) a perpendicular frame.

MULTITASKING, THE COMPUTER "WINDOW," AND THE MULTIPLE SCREEN

> *The distracted person (*der Zerstreute*), too, can form habits. More, the ability to master certain tasks in a state of distraction proves that their solution has become a matter of habit. . . . Reception in a state of distraction . . . finds in the film its true means of exercise.*
>
> —Walter Benjamin, "The Work of Art in the Age of Mechanical Reproduction"

In an oft-cited passage from "The Work of Art in the Age of Mechanical Reproduction," Walter Benjamin draws a distinction between the modes of "reception" of painting, film, and architecture. "Painting invites the spectator to contemplation/concentration," Benjamin explains, while "Architecture has always represented the prototype of a work of art the reception of which is consummated by a collectivity in a state of distraction." The film meets this mode of reception "halfway."[123] Architectural theorists have often bridled at Benjamin's dismissive generalization about the experience of architecture and, equally, film theorists have debated this assessment of the film spectator. But "reception in a state of distraction" now seems to provide a prescient model for the multitasking computer user.

For cinema spectators, the conventions of film narrative and the protocols of theatrical exhibition encouraged cognitive focus and engagement. (Specta-

tors who eat loudly, make out, talk on their phones—or otherwise multitask—are targets of social opprobrium.) Although the instances of split-screen and multiple-screen filmmaking described at the beginning of this chapter suggest that the film spectator was increasingly equipped to engage with such fractures in attention, televisual spectatorship much more directly encouraged the habits of a split-attentive viewer. The television's domestic site encouraged housewives to iron and fold laundry in front of the set, families to eat dinner with the TV on in the background, children to play with toys while watching cartoons. Channel switching, aided by accessory devices like the remote, implied the inherent potential to engage in a "mode switch." By contrast, the computer user must engage with the computer screen directly, as it only responds to the user's interactive "input." Yet the computer user can—and easily does—split focus and attention to multiple tasks, since computers can now routinely run multiple applications, each open in a different window.

Multiple "windows" made computer "multitasking" possible.[124] As one Web dictionary defines "multitasking," it is "working with various computer programs at one time in order to increase your productivity and reach your intended goal."[125] The windows interface made it easy for the user to switch back and forth between two documents or two applications. In order to theorize the subjective consequences of computer multitasking, we need to first consider the technical base of multiple-screen "windows." For a computer to multitask, the computer does tasks not simultaneously but serially, and yet at a high speed. (Even a slow computer with a hundred-megahertz processor can execute a million instructions between each pair of keystrokes.) While a computer microprocessor can keep many programs running at the same time (parallel processing), the user still "crosscuts" between one or more programs in selective sequence. Just as the instrumental base for the moving image—the retinal retention of successive virtual images—produced a newly virtual representation of movement and a complex new experience of time, the instrumental base for multiscreen multitasking poses new questions about the computer user's experience of time.

Computer multitasking makes it possible to combine work with leisure—running an Excel spreadsheet while checking email or shopping on eBay—and hence serves to equate productivity with a fractured subjectivity.[126] A 1998 *New York Times* article reported the following statistic: "Microsoft says the average office user of Windows 95 has more than three programs running at a time. At home, more than 10 million American households now have a television and a personal computer in the same room."[127]

Screen-based multitasking is only one form of multitasking. Using multiple screens (computers and TVs) or engaging in multiple activities (talking on the

phone while "watching" TV) has extended the meaning of "multitasking" to a more pervasive cultural mode. In a study of American leisure time habits in 2000, an MTV Networks/Viacom Study of Media, Entertainment, and Leisure Time reported that Americans spend time with media and entertainment 4.7 hours a day. For 2.9 of those hours, the average American simultaneously reads magazines and watches TV, listens to CDs and sends email. The results, the study reports, imply that a multitasker's average day has 29.8 hours of activity.[128] However, as another critic assesses the psychic liabilities of technologically enabled multitasking: "Technology didn't give us more time, it just upped the expectations of what we could do in the same time."[129] As a further indication of the effects of multitasking on styles of learning and thinking, consider the following advice on time management offered to college students: "Multi-window, multi-task activity is the norm for today's students. E-mail, games, and web searches are routinely managed simultaneously with writing papers or completing research assignments. Students have learned to value the pace and accessibility of video presentations and sound-bite synopses of popular culture. The slow, linear process of reading a book or attending a lecture may challenge a student's time management skills and attention to detail. While multi-tasking can be a valuable tool, so are focused attention and concentration. All are required for success in college."[130]

A George Washington University website offers the following recommendations:

> Multi-window, multi-task activity breaks concentration and consumes time rapidly.
>
> - Turn off or minimize your pop up windows. Avoid screen clutter and eliminate distractions.
> - Break tasks into manageable time blocks and stick to them.
> - Plan the hours of your day (or study periods) in advance. Schedule a time to return e-mail.
> - Control interruptions or even schedule 10 minute breaks for 50 minute study periods.
> - Make allowances for periods of relaxation.
> - Exercise and strengthen your ability to sustain concentration and absorb information by gradually increasing your study time and effort until you reach an established goal.
> - Create a variety of study aids to help focus your attention (e.g., index cards, tables, diagrams.)
> - Allow time to stop and think about connections among course materials, facts, and findings.[131]

This discussion of multitasking implies the direct cognitive effects of multitasking behaviors. Is the fractured subjectivity of multitasking in service of productivity and efficiency? Is it a mode of technologically enhanced labor-saving for the "human motor"? Does the liberatory rhetoric associated with multitasking (you can work where you want; take your computer to the beach or the café) merely mask the increased expectations of 24/7 productivity? (Do you really want your laptop at the beach?) Just as "alibi servers" help to evade surveillance, enacting a technological illusion of being elsewhere, computer "windows" can be alibi servers for identity. In *Life on the Screen,* Sherry Turkle describes how computer windows work to produce an identity with "distributed presence": "Windows provide a way for a computer to place you in several contexts at the same time . . . your identity on the computer is the sum of your distributed presence."[132] Turkle portrays the computer user as a "decentralized self" who, cycling between different windows, has a fractured but multiple identity.[133] She ascribes this screen life its theoretical analogs:

> [M]ore than twenty years after meeting the ideas of Lacan, Foucault, Deleuze, and Guattari, I am meeting them again in my new life on the screen. But this time the Gallic abstractions are more concrete. In my computer-mediated worlds, the self is multiple, fluid, and constituted in interaction with machine connections; it is made and transformed by language; sexual congress is an exchange of signifiers; and understanding follows from navigation and tinkering rather than analysis. And in the machine-generated world of MUDs, I meet characters who put me in a new relationship with my own identity.[134]

As a screen-based visual system, the "windows" interface subtly exponentiates what Erwin Panofsky described as the "unique and specific possibilities" of the cinema: the *dynamization of space* and the *spatialization of time.* On the computer, we can be two (or more) places at once, in two (or more) time frames, in two (or more) modes of identity, in a fractured post-Cartesian cyberspace, cybertime.

AUGURIES OF CONVERGENCE

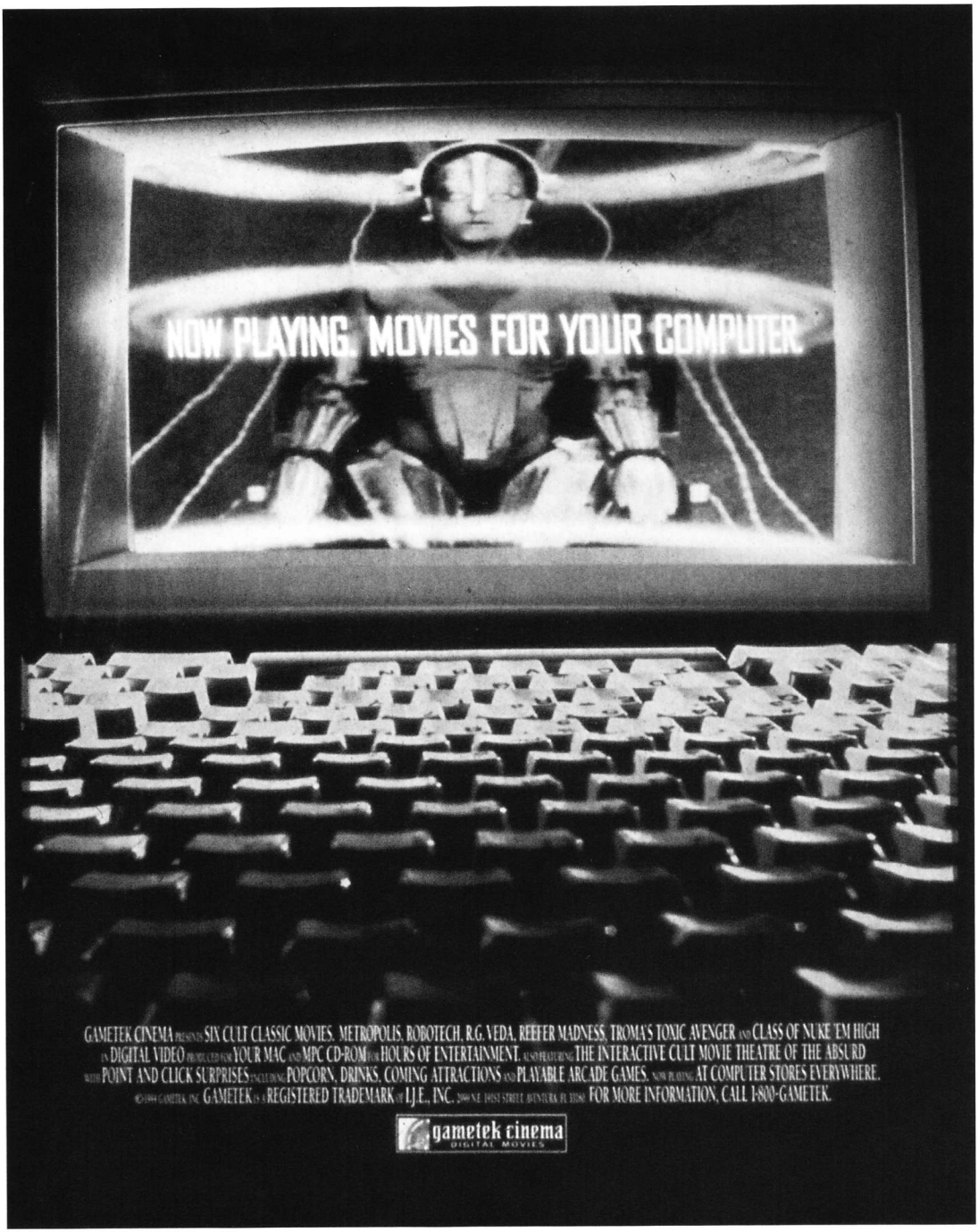
The screen featured in a 1995 ad faces its audience: the regimented rows of a computer keyboard, each key in the fixed position of a cinema spectator. The image—of the transformative moment in *Metropolis* when the metallic robot Maria is infused with the life force of electricity—suggests another moment of

transformation: the cinema screen has been replaced by its digital other, the computer screen.

By now, the once distinct material differences between cinematic, televisual, and computer screens have vanished.[135] Televisions have become more like computers: hard-disk video recorders (DVRs such as TIVO, Replay TV) record television signals onto an auxiliary hard-drive; HDTV-ready TVs use chips running mega-MIPS. Conversely, computers have become more like televisions: MPEG and QuickTime "movies" and "streaming" videos flash across and through Web browser pages. Networked multimedia home stations (Microsoft's X-box, Nintendo's Game Cube, Sony's Playstation 2) combine the functions of telephone, television, and gaming console with the computer, and further confound the technical differentiation of film, television, and the computer.

The segregation of histories of telephony, moving-image, and computing technologies appears—in postmillennial retrospect—to have been a set of arbitrary separations that disregarded the intermedial complexity of technological development. To write a "history" of these new media formations is to encounter many familiar historiographical challenges.[136] As Stephen Heath warned in an earlier historical moment (1978), when the "cinematic apparatus" seemed a dominant technological form: "Technological determinism substitutes for the social, the economic, the ideological, proposes the random autonomy of invention and development, coupled often with the vision of a fulfillment of an abstract human essence—and some of the wildest versions of this latter are to be found in accounts of the (then aptly named) 'media.' . . . [Cinema's] history is a history of the technological and social together, a history in which the determinations are not simple but multiple, interacting, in which the ideological is there from the start."[137] While careful not to overstate the determinations of technological development, Heath and other apparatus theorists attempted to provide an account of the technological and social specificities of the cinema as a single medium.

In this way, we may wish to regard Marshall McLuhan as the first apparatus theorist. Back in 1964, when McLuhan proclaimed, "the medium is the message," his sound-bite aphorism drew attention—not only to the *media*tion that the media implied, but also to the specificity of each separate medium. McLuhan inveighed against a content-based study of the media: "The 'content' of any medium," he writes, "blinds us to the characteristics of the medium."[138] Instead, McLuhan prescribes an analysis of the effects—"the change of scale or pace or pattern"—that each particular medium might produce. While McLuhan analyzed the interrelatedness of media in an evolutionary scheme ("The content of any medium is always another medium"),[139] he also insisted



5.25 "Now playing. Movies for your computer," 1995 ad from Gametek Cinema/Digital Movies. Gametek presents six classic cult movies: *Metropolis, Robotech, R.G. Veda, Reefer Madness, Troma's Toxic Avenger,* and *Class of Nuke 'em High.*

that each new medium would "institute new ratios, not only among our private senses, but among themselves, when they interact among themselves."[140] How, then, do we account for the "new ratios" produced by the rapid and recent changes in the screens and interfaces of moving-image media?

Nicholas Negroponte, another McLuhan-styled media prognosticator, offers a counterpolemical aphorism, turning McLuhan's "The medium is the message" on its head. Negroponte declares: "The medium is not the message in the digital world. It is an embodiment of it. A message might have several embodiments automatically derivable from the same data."[141] For Negroponte, digital technology dissolves the specificity of individual media: digital imaging, delivery, and display effectively erase the messages implicit in the source medium. Negroponte proclaims: "The basic difference between today's TVs and PCs has nothing to do with location, social habits, or our need to relax. It has to do with how the bits arrive."[142] If we follow Negroponte's axiom ("the medium is not the message in the digital world"), we arrive at a newfound determinism: digital technology inherently implies a convergence of all media forms.

German media theorist Friedrich Kittler anticipated this loss of media specificity when he wrote (in 1986), "The general digitalization of information and channels erases the difference between individual media."[143] Yet Kittler predicted that the installation of fiber-optic cable—and not the phone wires of the Internet or the wireless future of the Web—would be the technology to turn film, television, music, and phone calls into a "single medium."

The changes in screens and our "interfaces" with them have occurred at the speed of fast-forward. But have the screens of cinema, television, and computer really lost their apparatical distinctions? A recent sales website for flat-screen monitors conflates the multiple functions of the screen—TV, movie display, Internet browser—now displayed within the same electronic picture frame:

> Hanging on a wall they look more like art rather than a TV set. When you're not watching TV, DVD videos, surfing the net or reading your e-mail, there is no need to switch the plasma panel off. It can be used as an electronic picture frame, with a continuously changing selection of artworks of your choice: An endless art collection![144]

Or, as the Consumer Electronics Association predicted in 2002:

> In the ultimate living room, TVs and music don't stand alone; they interact with each other, with the Internet, with the PC in the home office or the electronic game equipment in the family room.[145]

Auguries of convergence always suggest a teleology: some media are seen as transitional, while others seem destined to evolve into the next species. A media paleontologist could examine the fossil remains: the VCR may have begun to erode the differences between televisual and cinematic viewing; the DVD may have became the delivery format to serve the displays of computers and televisions alike. New-generation gaming consoles offer features that include DVD players, output jacks for HDTV, broadband connections, and hard drives for storing music and games. While newer iterations of the gaming console seem poised to further bridge the gap between the digital world of the personal computer and the analog world of television, one cannot predict what delivery or display format will survive the vicissitudes of the consumer market. There have been earlier attempts at marketing the convergence of television, computer, and cinema screens that failed. In 1993, Apple introduced the "Macintosh TV," a convergence appliance that anticipated a hybrid computer-user/television-viewer who would use the same CRT screen as a television receiver and computer display. But Apple decided the market wasn't there: the Mac TV was discontinued almost before it began.[146] In 1996, "WebTV," an Internet appliance marketed to users who might want to access the Web on their television screens, imagined a convergence that bypassed the personal computer. The convergent screen of Microsoft's XP Media Center is positioned to fulfill these earlier promises. The television screen (big screen, plasma screen, LCD screen) is now coequal with the pixels of computer "display."

"New" media imply the ever-obsolescence of the "old." As Antonio Gramsci put it: "the old is dying and the new cannot be born; in this interregnum a great variety of morbid symptoms appear."[147] And yet, amid these morbid symptoms, the continued engagement with a "virtual window" seems somehow assured.